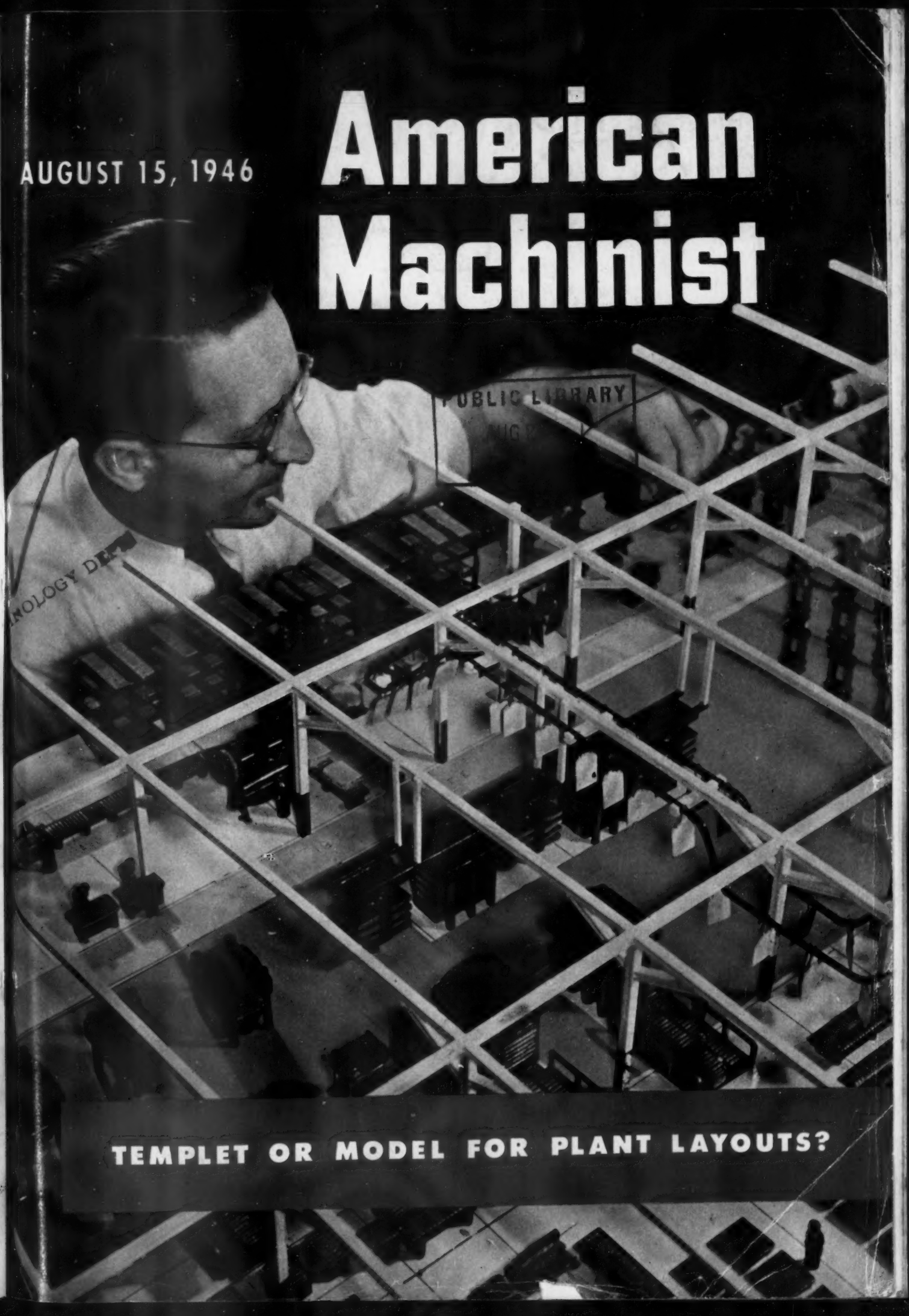
AUGUST 15, 1946

American Machinist



TEMPLET OR MODEL FOR PLANT LAYOUTS?

Your PRODUCTION LINE Starts Here

. . . on the Heald Run-Off Floor higher machining goals are met in less time, at less cost.

Before a Heald machine is ever delivered to the customer, it has already done the job it was ordered for—under actual shop conditions, here on the Run-Off Floor in the Heald Plant. This is the Heald testing ground, where new machines must prove that they're *better* machines, by doing the customer's job—whether it's grinding or borizing—with greater efficiency, greater economy, greater speed and greater precision.

For example, a method tested on the Run-Off Floor for grinding 200 bearing races an hour enabled another customer to turn out engine sleeves six times faster! Again, multiple Bore-Matic operations actually quadrupled the production rate on distributor cams. And when Heald engineers devised a way to finish automotive pump bodies three-at-a-time, with far greater accuracy, production jumped 127 per cent.

Results like these, proven on the Heald Run-Off Floor, can directly affect *your* machining operations—speeding output, eliminating rejects, saving man hours. If you have any precision finishing problems, Heald engineers will be glad to take them up with you. Chances are that your production line, too, will benefit from a tryout on the Run-Off Floor. Just call or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS for August 15, 1946

VOL. 90, NO. 17

ADMINISTRATION

Editorial ..... *Burnham Finney* 99
Templet or Model for Layout ..... *R. W. Mallick, J. H. Sansonetti* 101
Probability and Quality Control. 1 ..... *Eugene Goddess* 110
Selective Reduction of Harmful Noise ..... *J. S. Miller* 116
Equal Pay for Equal Work ..... *Round Table* 121
Tool Kits Cut Cost ..... *M. Mastalerz* 129

ENGINEERING

Hard Carbides Find Non-Cutting Uses ..... *Phillip M. McKenna* 117
Design for Duplex Cutting ..... *Ernest Wildhaber* 122
Electronic Relay Systems, *Electronics 17* 134

MATERIAL CUTTING, FORMING

Thin Stock Demands Special Die Design ..... *Wallace C. Mills* 112
Shop Shots 132
Boring Large Holes with a Small Miller ..... *Norman Brockett* 137
Chip Remover Operates with Vacuum Air Blast ..... *Earl M. Leigh* 139
Height Gage Sets Lathe Tools ..... *Christopher McGinnis* 140

TOOLING

Adams' "Ribs" Aren't Missing ..... *E. J. Tangerman* 106
Adjustable Micrometer Is Easy to Make ..... *James Taylor* 135
Quick Lathe Setup Cuts Short Wire Lengths ..... *Joseph F. Budnick* 136
U-Bracket Prevents Slew in Shaper Toolpost ..... *Harold Baird* 137
Leveling Screws Adjust Toolmakers' Clamp ..... *Fred T. Oetjen* 138
Adjustable-Wedge Toolholder Turns Carbides ..... *Charles Bily* 139

ASSEMBLY AND INSPECTION

Air Pressure "Inspector" Simulates Load ..... *Charles Toeffel* 135
Fixture Stacks and Rivets Laminations ..... *John Joseph Koster* 136
Plastic Stop-Off Simplifies Plating ..... *Harry Murray* 139

NEWS OF METALWORKING

Spot News 97
News of Metalworking 145
Gaging Business 146
Detroit Letter 147
Washington Bulletin 149
Names in the News 151

DEPARTMENTS

Talking Shop 105
Tips for Top Shop Men 128
Reference Book Sheets 141
Shop Equipment News 153
Parts and Materials 166
To the Editor 170
Round Table Discussions 176
Quotes 180
New Bulletin Insert 192
Advertisers Index 289, 291

PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cable Address "McGRAWHILL, New York"

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Chips and QUIPS

Cover Kodachrome . . . Lew Bell, plant layout engineer, studies a preliminary layout of the molding and fabricating section at the Trafford Micarta Division, Westinghouse. When completed, the model will cover all sections of the plant, plus familiarizing plant personnel from foreman to management with existing facilities and permitting them to examine in integrated detail, any proposed changes or additions. It accompanies and illustrates the lead article.

Adam's Ribs . . . For something a bit unusual in metalworking, we suggest you look over the report on slightly zany operations at S. S. Adams Company. Here are ideas in a setting of summer lightness.

Further Suggestions . . . As Wildhaber's series on hypoids ends in a 7-page package, we begin a two-part article on statistical quality control and continue our series on electronic applications. Engineers will also be interested in the discussion on effect of soldering on copper wires . . . Tool men will want to study Phillip McKenna's article on more unusual applications of carbides and Wallace Mill's report on die designs for thin-stock. Both are written by men with long backgrounds in their fields.

Turned Head . . . Our collective editorial head is in danger of turning, from the flood of compliments on recent special reports. Says J. S. Buhler of North American Phillips, for example: "I feel that Mr. LeGrand should receive recognition for praiseworthy performance, having so successfully and, to my mind, accurately covered a field so highly diversified (Non-destructive Testing) . . . Mr. Buhler knows the difficulties—he has had similar assignments. . . . Commenting on "Color in the Shop," says L. W. Jones, vice president of The Vulcan Tool Co.: "We are indeed color-minded at Vulcan. An experiment which started some time ago resulted in our doing the entire toolroom in 1940 and 1941. Since that time the power on new machine tools is not turned on until we have completely done the machines in our color scheme." . . . Bethlehem Steel, repainting one works, asked 50 copies for all foremen. We squeezed out five.

Materials Handling has drawn a number of favorable comments, from within and without the trade. Jules Diercks, who sells M. H. equipment beat the flood with his compliments and request for 100.

Happy Surprise . . . A friend of ours recently visited the professor setting up a nuclear-fission laboratory for a large Eastern college. This "theoretical" researcher conducted our friend through his well-equipped home machine shop, then said in parting: "By the way, read Mr. Borden's article in *American Machinist* for April 25. He's got a crackerjack tool-control system. I'm going to put it in the lab.—it will keep plenty of tools from disappearing." *Editor's Note:* The friend had tipped us off to the article in the first place.

Really Practical . . . On page 144 of our May 9 "Practical Ideas" was described a hardwood block for making a spring winder. A. C. Huston, chairman of the board, Gates Paper Company Ltd., Los Angeles, writes: ". . . we made one of these up for our machine shop and found that it was a very useful addition to our equipment."

Coming . . . Keys avoid close-tolerance die-shoe milling at Caterpillar . . . How the Erie maintains its diesel locomotives . . . Static causes painted products to shed tears . . . Essentials of flash welding . . . A 16-page special report on lighting the shop . . . An accurate method of checking tips on big drills . . . The "Standard Day" defined . . . How to bond sapphire to other materials . . . And our usual departments . . . All in Aug. 29.

Special Reporter . . . Here's the man whose name has been on four outstanding special reports since Dec. 20: two on lubrication, one each on plastics and stainless steel. Harold L. Flynn is a Canadian, born at Murray Harbour, P.E.I., 35 years ago. He had a couple of years of engineering at St. Francis Xavier U. in Antigonish, N. S., followed by a couple years of arts at Dalhousie U. in Halifax. After 10 years on newspapers, he was editor of various Canadian technical magazines, one on leather, another on plastics, the third on machine production for periods ranging from one to five years. He even had a stretch in advertising in a Montreal agency. He's been on the staff of A.M. for the last year and a half.

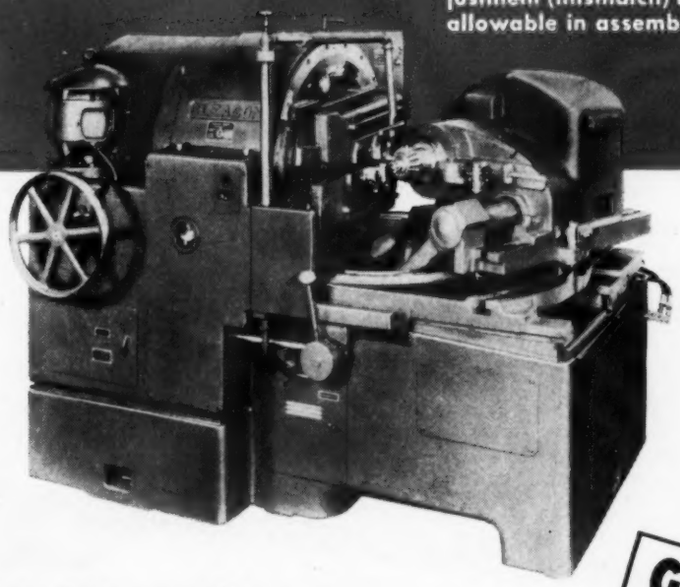
In case you're feeling athletic, he was a semi-pro pitcher, a rugger player, a golfer, and is even a tennis and badminton player, when his writing assignments give him time.

NOW IT'S LOCALIZED TOOTH BEARING for STRAIGHT BEVEL GEARS

Coniflex . . . a word you'll be hearing of more . . . that's Gleason's coined word for localized tooth bearing and now Gleason engineering offers Coniflex gears to users of straight bevels . . . straight bevel gears with a localized tooth bearing thus permitting a slight amount of adjustment (mismatch) in assembly and with some displacement under operating loads without concentration of the load on the ends of the teeth.

ADVANTAGES? YES!

1. **Wider tolerances—allowing slight deflections in operation without dangerous concentration of the loads on the end of the teeth.**
2. **Smoother operating—localization of tooth contact in Coniflex gears assures a *good* tooth bearing under operating loads . . . positioned where the engineer planned it . . . thus smoother and quieter.**
3. **Easier assembling—slight amounts of adjustment (mismatch) in Coniflex gears are allowable in assembly.**



The 12″ B Straight Bevel Generator has a positive, cam-controlled advance of the tool slides at each end of the cutting stroke assuring a localized tooth bearing on the gear.

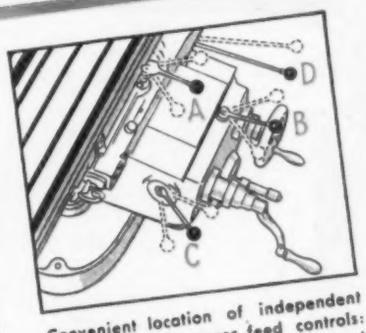
GLEASON Works
1000 University Ave
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over 80 Years

The New
CINCINNATI No. 2 MI MILLERS *are easier to*

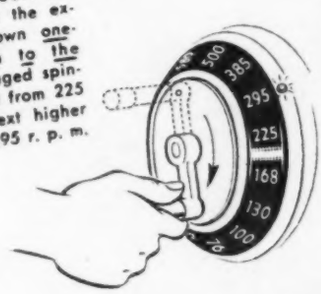
If you could spend a few minutes at the controls of the new CINCINNATI No. 2 MI Miller, you would understand why it is so well liked by the shopmen who have seen it. ¶ Look at the operational features illustrated here. All controls are arranged to simplify manipulation and reduce operator effort. Feeds and speeds are easily and quickly changed while standing at the normal working position. All other control elements are equally accessible. The No. 2 MI's are safe, they stay accurate for years, and maintenance cost is exceptionally low. Powered by 5 h. p. motors, they are available in Plain, Universal and Vertical styles. ¶ We'll be glad to tell you more about all the features of these versatile knee-and-column type milling machines and why they offer important cost cutting advantages to shops handling small- to medium-sized parts. Engineering details may be obtained by writing for catalog M-1429-1.

Pull out, quick adjusting micrometer dials on hand traverse controls are reset easily and quickly — no thumbscrews to loosen.

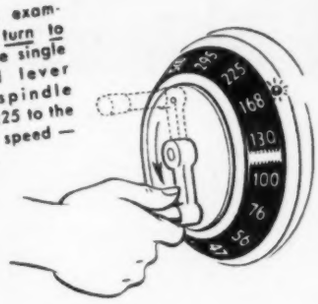


Convenient location of independent and directional power feed controls: A) Table feed lever. B) Cross feed lever. C) Vertical feed lever. D) Rapid traverse lever.

Right: A single lever selects all speeds. In the example shown one-half turn to the right changed spindle speed from 225 to the next higher speed—295 r. p. m.



Right: In this example one-half turn to the left of the single speed dial lever changed spindle speed from 225 to the next lower speed — 168 r. p. m.

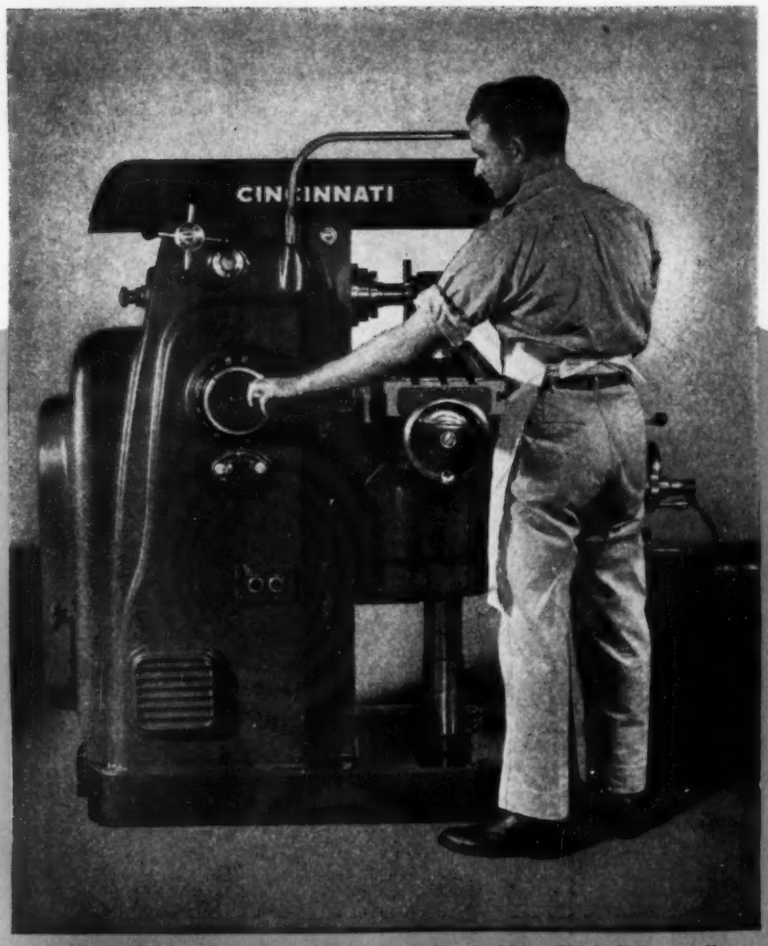


THE CINCINNATI M

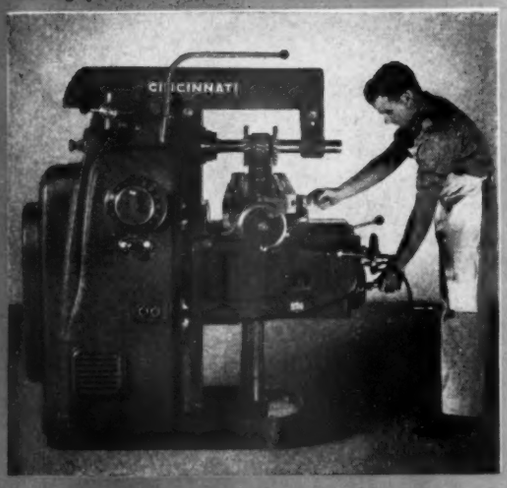
MILLING MACHINES

operate!

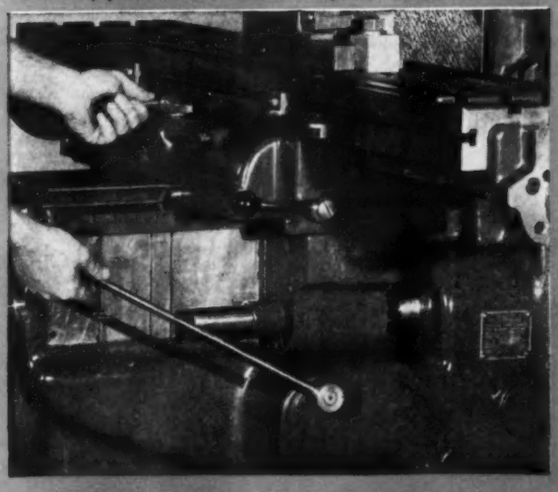
The No. 2 MI's adjustable starting lever offers greater convenience in starting the machine from any desired working position.



Changing spindle speeds from the front of the machine. Single lever on direct reading speed dial is within easy reach of operator's working position. The operator simply rotates the handle — hydraulics do the work of shifting gears.



A half turn of a single lever changes feeds. Similar to speed changes (see illustrations opposite page).



Engaging power rapid traverse to the table. This feature applies to cross and vertical movements also.

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U.S.A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

NO[illegible] THE PUZZLE OF THE

VANISHING DOLLAR?

Get this! Three gents put up at a hotel, paying $30 rent in advance. Shortly afterward the clerk discovers that he has overcharged them $5, so he sends that amount back by the bellhop. But the bellhop, a weak character, returns only $3. Now the men have paid $27 and the bellhop has $2 — making a total of $29. *What became of the extra dollar?*

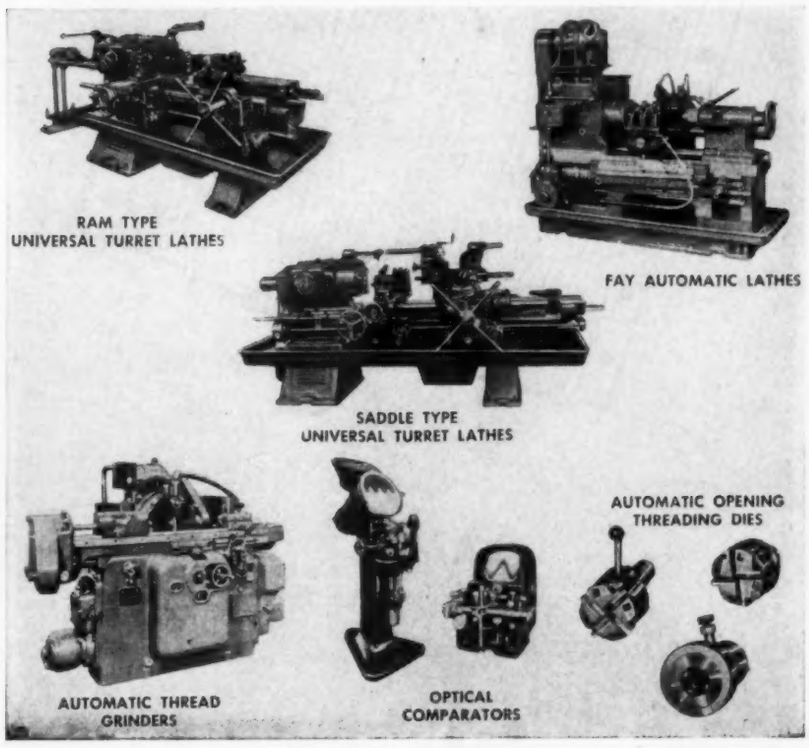
And a very appropriate little problem, too. For many's the dollar that's vanishing, these days, in seemingly simple operations.

Metal turning costs are a problem. The chances are that turning accounts for 25 per cent or more of all machining time in your plant.

There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the use of Jones & Lamson machines. Our machines are designed specifically for the most efficient use of carbide tools which can remove metal 200 to 500 per cent faster. We have solved many tough cost problems. Solving them is our business.

Be skeptical of the production efficiency of all metal turning equipment in your plant.

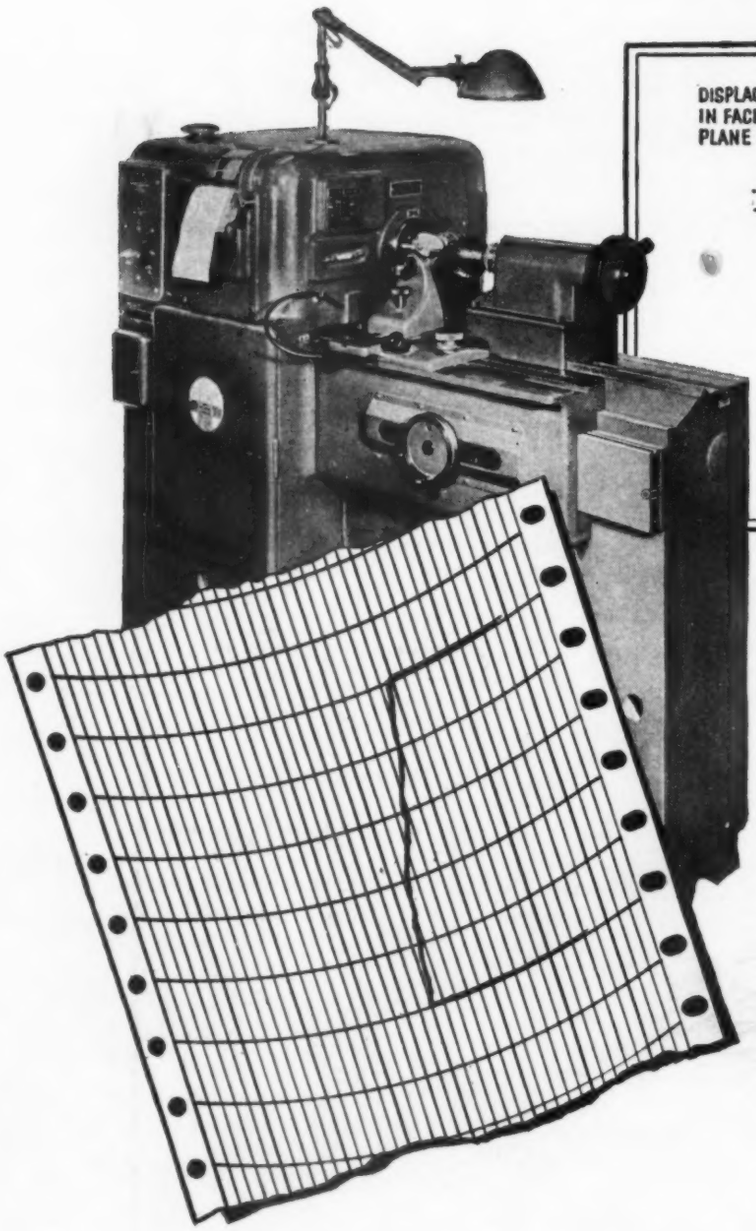
Telephone or write for a Jones & Lamson engineer who will be glad to consult with you on all phases of your metal turning problems.

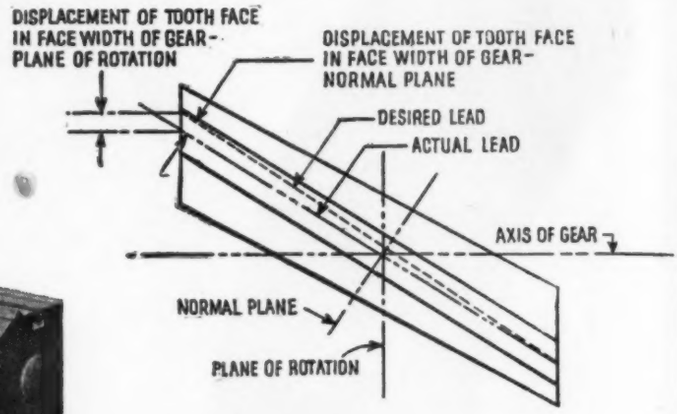


JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

How HELICAL GEAR *Checking*




DISPLACEMENT OF TOOTH FACE IN FACE WIDTH OF GEAR - PLANE OF ROTATION
DISPLACEMENT OF TOOTH FACE IN FACE WIDTH OF GEAR - NORMAL PLANE
DESIRED LEAD
ACTUAL LEAD
AXIS OF GEAR
NORMAL PLANE
PLANE OF ROTATION

1. In Setting-up for Shaving, Lapping or Grinding

The critical need in gear finishing operations is to determine the amount of *"tooth displacement"*, if any, and the direction and amount of such tooth displacement. With data accurately recorded, the corrective adjustments in the angular setting of shaving tools, laps, or grinding machines, becomes a simple and easy matter.

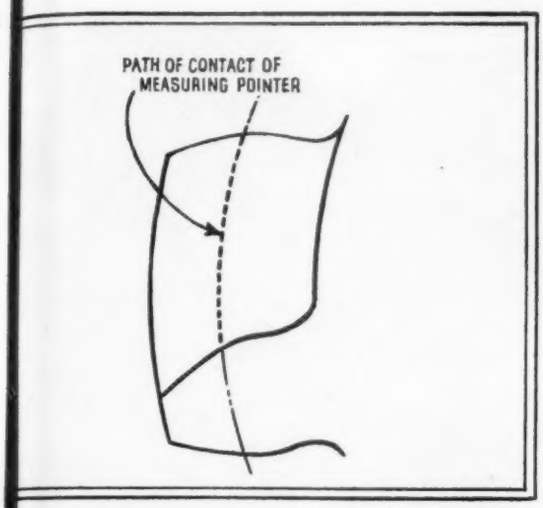
A basic function of the Fellows Lead Measur-

● **GOVERNMENT SURPLUS MACHINE TOOLS:** We are licensed under the WAR ASSETS ADMINISTRATION to act as dealers in the disposal of Government Surplus Machinery. Those interested in obtaining such machinery should contact our Main Office, Springfield, Vt.; or our offices in Detroit, Mich. and Chicago, Ill.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

on the Fellows Lead Measuring Instrument

SIMPLIFIES PRODUCTION CONTROL



ing Instrument is to provide just that information, in graphic chart form—with any departure from theoretical perfection magnified 500 times.

The accompanying diagram shows and identifies a typical tooth displacement error—and the chart alongside shows how that error is graphically charted where the space between each heavy ruled line represents 0.001".

Every shop manufacturing quality gears on a production basis will want complete information on this new and basic inspection device.

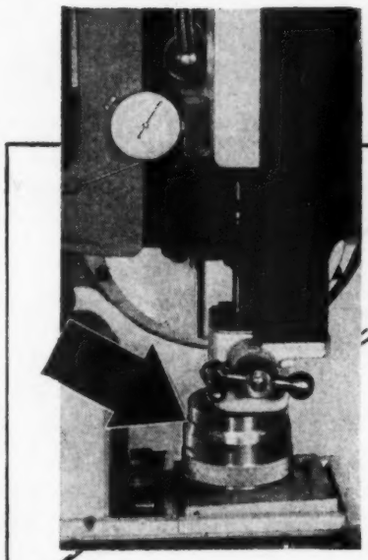


Photo shows a close up of the front slide and micrometer for setting.

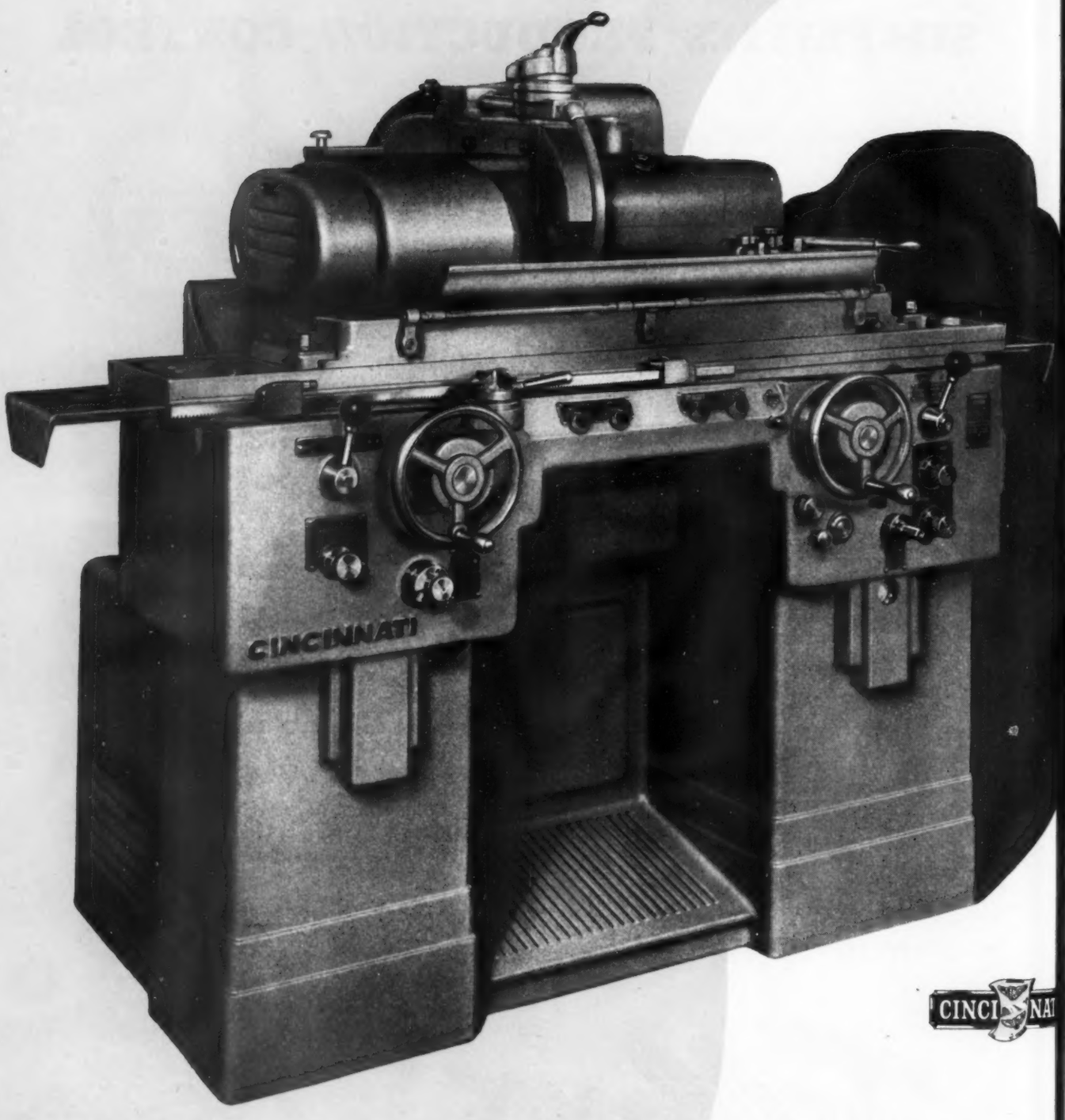
2. In Checking Production Machines for "Lead" Accuracy

The Fellows Instrument functions quickly and easily, too, in determining the actual "lead" of a gear, and the amount of departure from the specified "lead". The departure from the required lead is simply obtained by a micrometer setting of the front slide which controls the rate of movement of the indicator slide relative to the rotation of the work. The micrometer gives direct readings in tenths of a thousandth, and this difference between the theoretical setting and the actual setting of the slide, when multiplied by a factor, gives the error in lead.

Fellows

Write for descriptive bulletin. The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit—or 640 West Town Office Bldg., Chicago.

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



CINCINNATI

CENTER TYPE GRINDING MACHINES

A NEW

Grinding Machine by Cincinnati

THE 4" FILMATIC PLAIN HYDRAULIC

This new member of the CINCINNATI line of FILMATIC bearing grinding machines is designed for precision traverse grinding operations on small work. It swings 4" diameter over the table, and is built in 12" and 18" between-center lengths. The machine has many new and exclusive features such as: FILMATIC grinding wheel spindle bearings; hydraulic table traverse, infinitely variable from 3 to 280 inches per minute; accuracy of table reversal within .001"; dog controlled table traverse stroke as short as 1/16"; automatic pressure lubricating system for table and wheelhead ways; dial controlled pick-feed adjustment. ¶ A tabulation of all design features and specifications may be obtained by writing for catalog G-520. Brief description will be found in Sweet's Catalog File for Mechanical Industries.

GRINDERS INCORPORATED

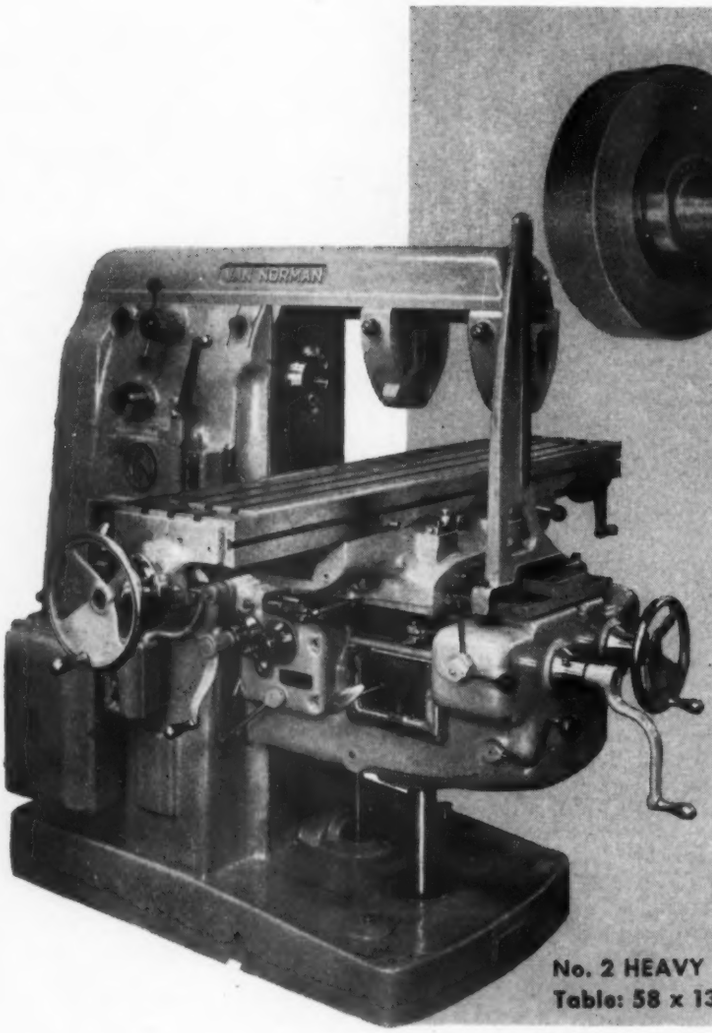
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

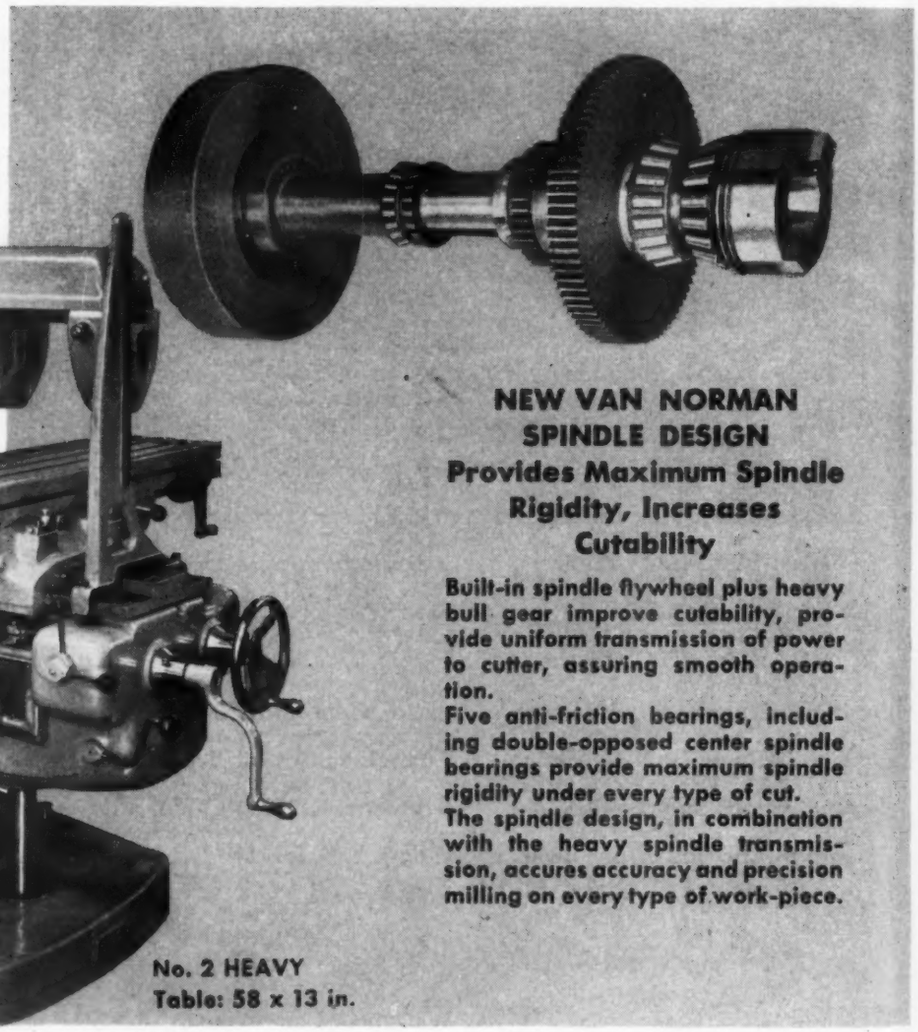
TWO VAN NORMAN HORIZ

that pay production dividends on

No. 2 HEAVY This new heavy-duty miller embodies many design and construction features that give greater ease of operation, utmost accuracy and increased output. Heavy built-in flywheel increases cutability. Front and rear directional power feed controls and six-way rapid traverse, as well as hand adjustments provide ease of operating control. Single lever feed and speed selectors permit instant selection of the proper feed or speed. Hardened alloy steel gears mounted on multi-splined shafts rotating on anti-friction bearings assure long life. Massive knee, saddle and table assembly and heavy scientifically internal ribbed column and base provide maximum ruggedness and dependability. Investigate the No. 2 Heavy for milling of heavy and medium work. Available with Plain or Universal Saddle.



No. 2 HEAVY
Table: 58 x 13 in.



NEW VAN NORMAN SPINDLE DESIGN Provides Maximum Spindle Rigidity, Increases Cutability

Built-in spindle flywheel plus heavy bull gear improve cutability, provide uniform transmission of power to cutter, assuring smooth operation.

Five anti-friction bearings, including double-opposed center spindle bearings provide maximum spindle rigidity under every type of cut.

The spindle design, in combination with the heavy spindle transmission, accures accuracy and precision milling on every type of work-piece.

VAN NORMAN COMPANY

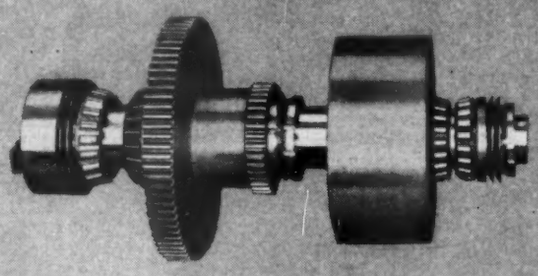
"It Pays to

ORIZONTAL MILLING MACHINES

ds on Horizontal Milling Applications

No. 2 MEDIUM

The new No. 2 Medium provides unusual compactness with exceptional rigidity and dependability, assuring smooth operation on all types of cuts. A general purpose machine for medium and smaller parts, it combines rugged strength with extreme sensitivity. Front and rear directional power feed operating controls are at the operator's finger tips for ease of operation. Conveniently located speed and feed selectors provide instantaneous selection with minimum effort. Spindle clutch lever is quickly adjusted to most convenient operation. Pilot wheel permits easy adjustment of ram-type overarm. Automatic lubrication, anti-friction bearings, multi-splined shafts assure long life and accurate performance. The No. 2 Medium is available with plain or universal saddle. Write for information.

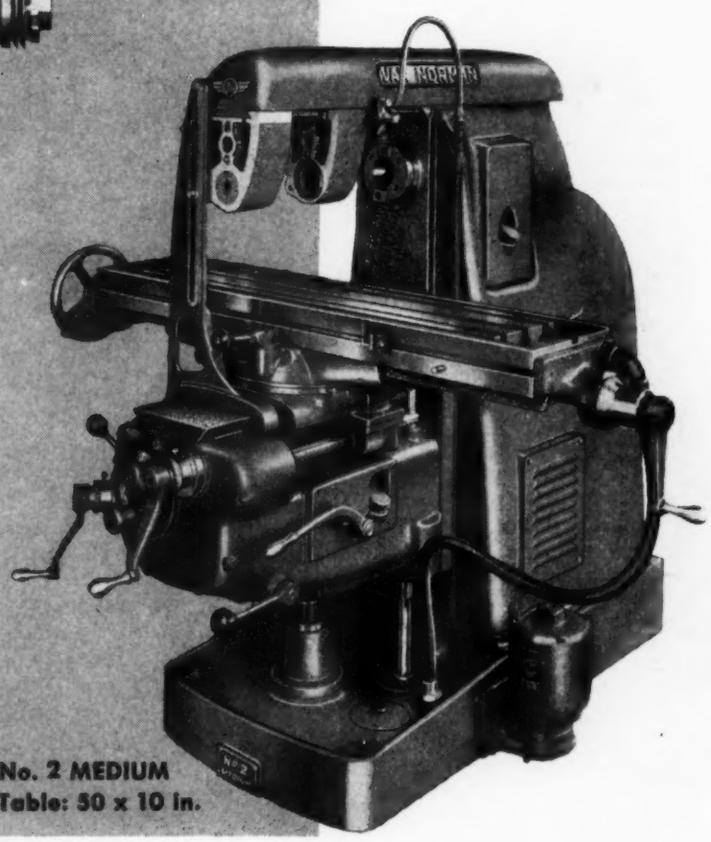


BUILT-IN SPINDLE FLYWHEEL Provides Improved Cutability

Mounted on the spindle inside the column, the heavy built-in flywheel, plus the large bull gear, assure uniform cutting operation by providing smooth transmission of power to the cutter.

Double opposed anti-friction bearings at both front and rear provide maximum spindle rigidity . . . eliminate spindle vibration.

Large alloy forged steel spindle is hardened and ground for accuracy and long life.



No. 2 MEDIUM
Table: 50 x 10 in.

SPRINGFIELD 7, MASS.

to Van Normanize"

LANDIS 4 Spindle

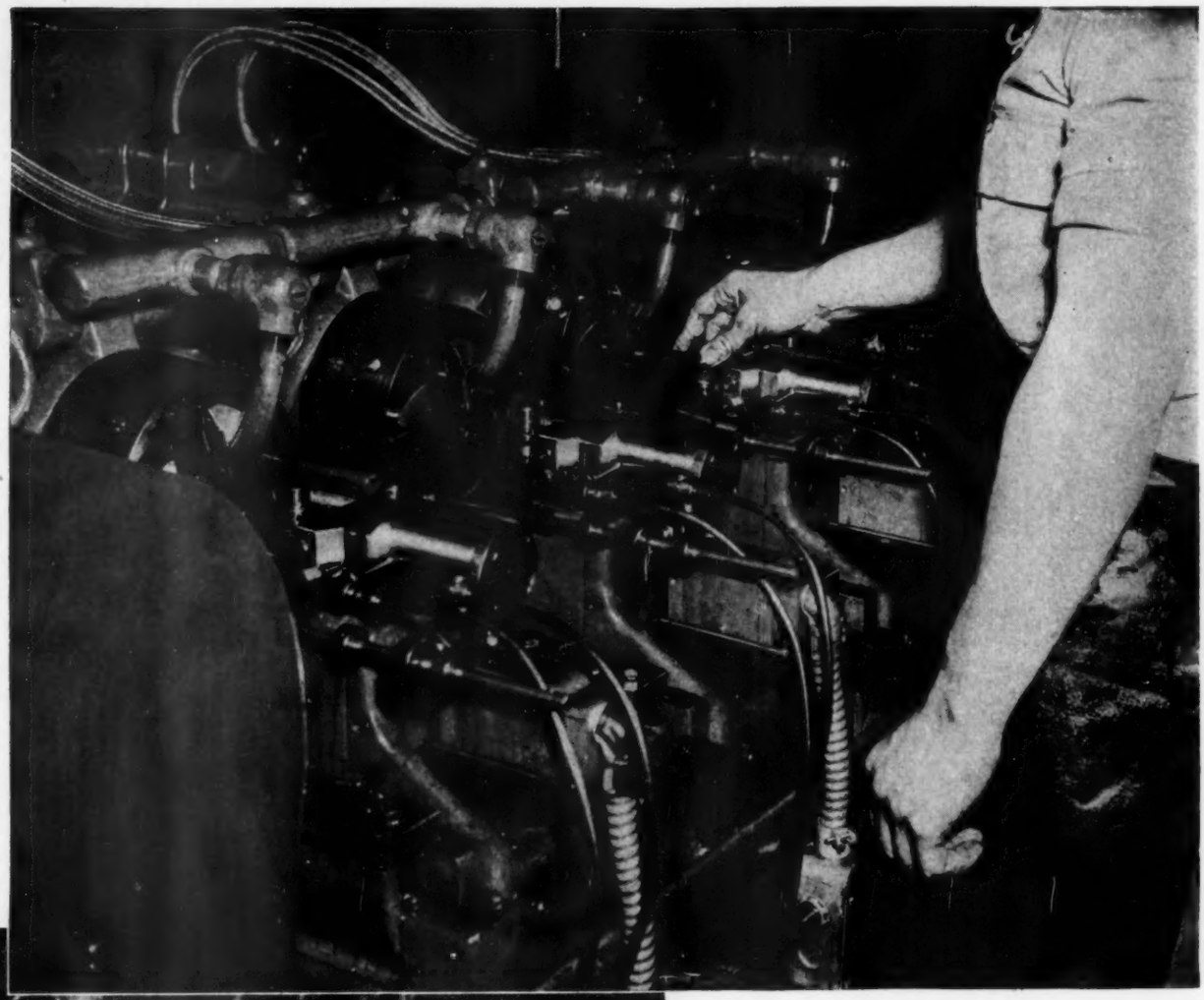
SEMI-AUTOMATIC THREADING MACHINE

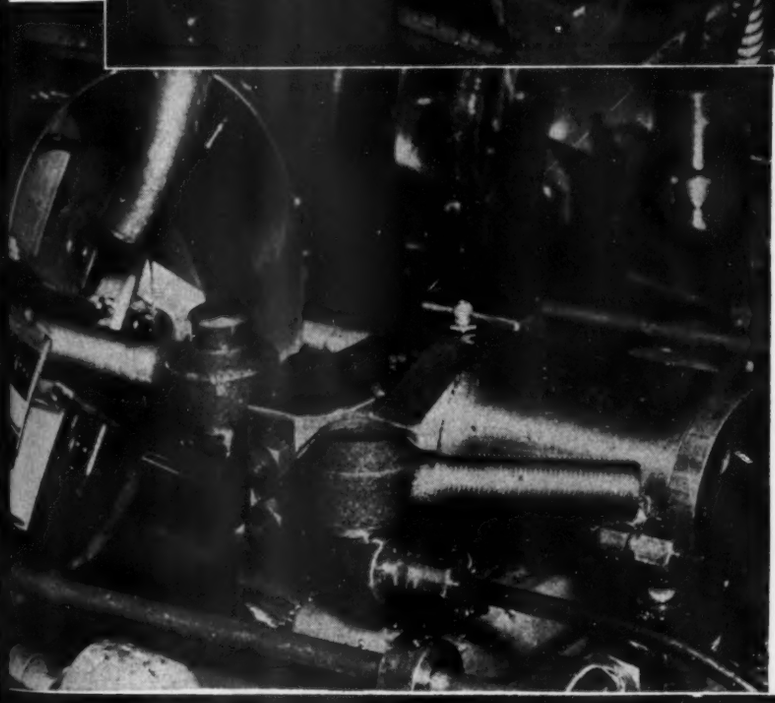
The Landis 4 Spindle Semi-Automatic Threading Machine is a precision machine designed for threading automotive parts, bolts, studs, rods, etc., on a high production basis.

Due to exclusive features in design it offers an unusually high percentage of efficiency.

Outstanding advantages are: High Production at Low Threading Speeds, Quick Set-Ups, Flexibility for all Diameters and for Special Threading Operations, Elimination of Side Shave at Start of Thread, and Thread Concentricity.

For detailed information write for Bulletin E-88.





Threading Tie Rod Ends—upset forgings — 140 to 183 Brinell hardness — 5/8" diameter — 18 pitch threads — 2.125" long — Class 3 fit—at rate of 650 per hour.

Average production ranges from 500 to 2000 pieces per hour, depending upon diameter and thread length.

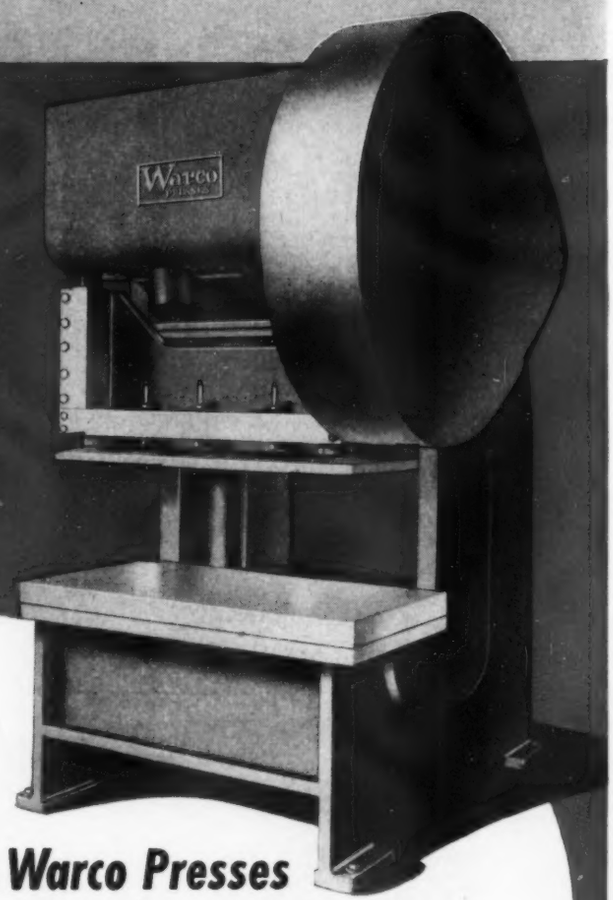
LANDIS
REG. U.S. TRADE-MARK PAT. OFF.

MACHINE CO. WAYNESBORO PENNA. U.S.A.

Engineered for Greater Strength, Rigidity, Accuracy, Power and Endurance

Warco PRESSES

WELDED STEEL CONSTRUCTION
WELDMENTS... fully stress-relieved



Double Crank Gap Press

Warco double crank gap presses, with capacity range from 100 to 500 tons, permit easy handling of large diameter jobs and continuous work with wide strip stock. Welded steel frame, rigidly reinforced at the gap, virtually eliminates "spring action" at the opening, even under capacity loads.

How Added Life Is Built Into Warco Presses

Facilities equalled by few heavy fabricating plants in the world, plus the experience of skilled craftsmen, assure the finest weldments possible in Warco press frames and other welded parts. Further, Warco anneals all weldments to prevent locked up stress that could, as in the case of frames, lead to misalignment from overload.

In many other ways Warco designers have built added years of satisfactory service into Warco welded steel presses. Welded steel construction provides superior rigidity, strength, accuracy, and endurance.

Warco is prepared to handle your inquiry promptly. Consult us today, and when in Warren, be sure to visit our modern and complete factory, the largest of its kind in existence.

WARREN CITY MANUFACTURING COMPANY
1952 Griswold Street, Warren, Ohio
A subsidiary of
The Federal Machine and Welder Company • Offices in Principal Cities

ADVANTAGES WORTH CONSIDERING

All Models Electrically Controlled
Solid Frame
Friction Clutch and Brake Unit on All Models
Standardized Replacement Parts

ECCENTRIC GEAR PRESSES • OBI PRESSES
HYDRAULIC PRESSES • PRESS BRAKES

Want to ELIMINATE SMOKE in your shop?

Because it is a *chemical emulsion,* Cimcool CAN'T smoke. But that's not all. This radically new and different cutting fluid combines friction reduction and cooling capacity in a degree never before obtained.

CHECK ALL THESE ADVANTAGES!

- No fire hazard . . . No slippery film.
- Non-irritating. . . doesn't grow rancid.
- Faster cooling allows faster cutting.
- Uniform work temperature increases accuracy.
- Chemical lubricity increases tool life.
- Long lasting rust inhibitor included.
- Covers 85% of all metal working jobs.

CIMCOOL DIVISION OF
THE CINCINNATI MILLING MACHINE CO.,
CINCINNATI 9, OHIO, U. S. A.

Copeland Refrigerator Corp.
***Did by Using* CIMCOOL.**

"Since using Cimcool, we have eliminated a very bad smoke condition which existed in the shop," writes The Copeland Refrigeration Corp. of Sidney, Ohio, and adds: "Cimcool has also eliminated a Monday morning odor. In addition, we find tool life has increased by approximately 150 percent."

CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

SETUP AND GRINDING TIME CUT 50%

6" x 18" PLAIN HYDRAULIC GRINDER—Special features include cat head chuck, 30° angle wheelbase, right hand wheel mounting, bed type locator for wheel dressing and grinding positions, right angle wheel dresser, hydraulic rapid infeed, hydraulic timing cycle. Catalog B45

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

COSTS LOWERED AND PRODUCTION SPEEDED

ANOTHER EXAMPLE of LANDIS TOOL ENGINEERED GRINDING SERVICE

The grinding of the O.D. of a shoulder and the face of an A.P.I. working barrel valve seat normally required two separate setups and two separate grinding operations.

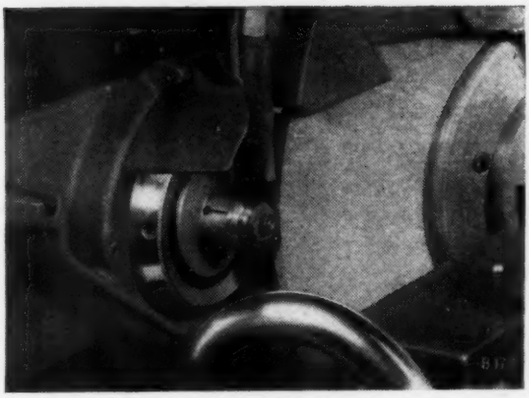
Landis Tool grinding engineers suggested that the two grinding operations be combined by means of an angle wheelbase grinder. This could be done readily by starting with a standard 6" x 18" Type CH Plain Hydraulic Grinder. To mount the wheelbase at an angle the wheel mounting was moved from the left to the right side. A regular cat head chuck provided the work holding fixture. Production was further speeded by the use of the optional hydraulic rapid infeed and hydraulic timing cycle. In this way the two grinding operations were done at once and one setup was eliminated.

Here are the results:

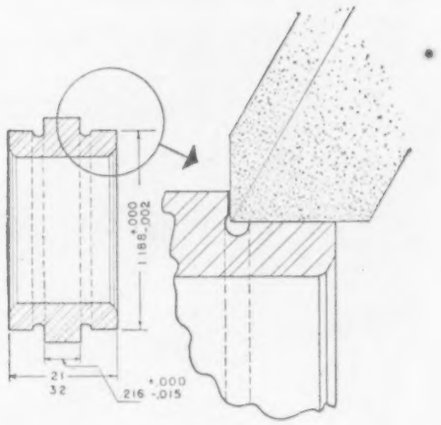
1. Production was more than doubled
2. Unit costs were reduced
3. Machine investment requirement lowered
   - (a) Because two operations combined
   - (b) Modified standard machine used

Whether your grinding problem is simple or complex, you will get a practical low cost solution when you call upon Landis Tool Engineered Grinding Service. Write us for help on specific problems.

CENTERLESS GRINDERS TOO, BY **LANDIS TOOL** ...OF OUTSTANDING NEW DESIGN. WRITE FOR CATALOG T49



CAT HEAD CHUCK holding valve seat with right hand mounted wheel set at an angle to grind diameter and adjoining shoulder.



Drawing of typical valve seat with diameter and shoulder to be ground on each end. Closeup shows two planes ground at once eliminating a setup. Remove .008"—.012" from O.D and .004" from face Production 75 complete valves per hour

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

TEAMWORK

Courtesy

THE AMERICAN TOOL WORKS

K FOR PROFIT

Courtesy of Fairbanks, Morse & Co.

Quality Tools produce a Quality Product . . .

Fairbanks, Morse & Co., one of the world's leading manufacturers of Electrical Equipment and Diesel Engines, uses scores of "American" Hole Wizard Radial Drills to produce quality at a profit.

The smooth operation and easy handling of "American" Radials give them front rank recognition amongst users as dependable producers of accurate and finely finished work.

The directly connected, head mounted motor guarantees maximum power at the spindle.

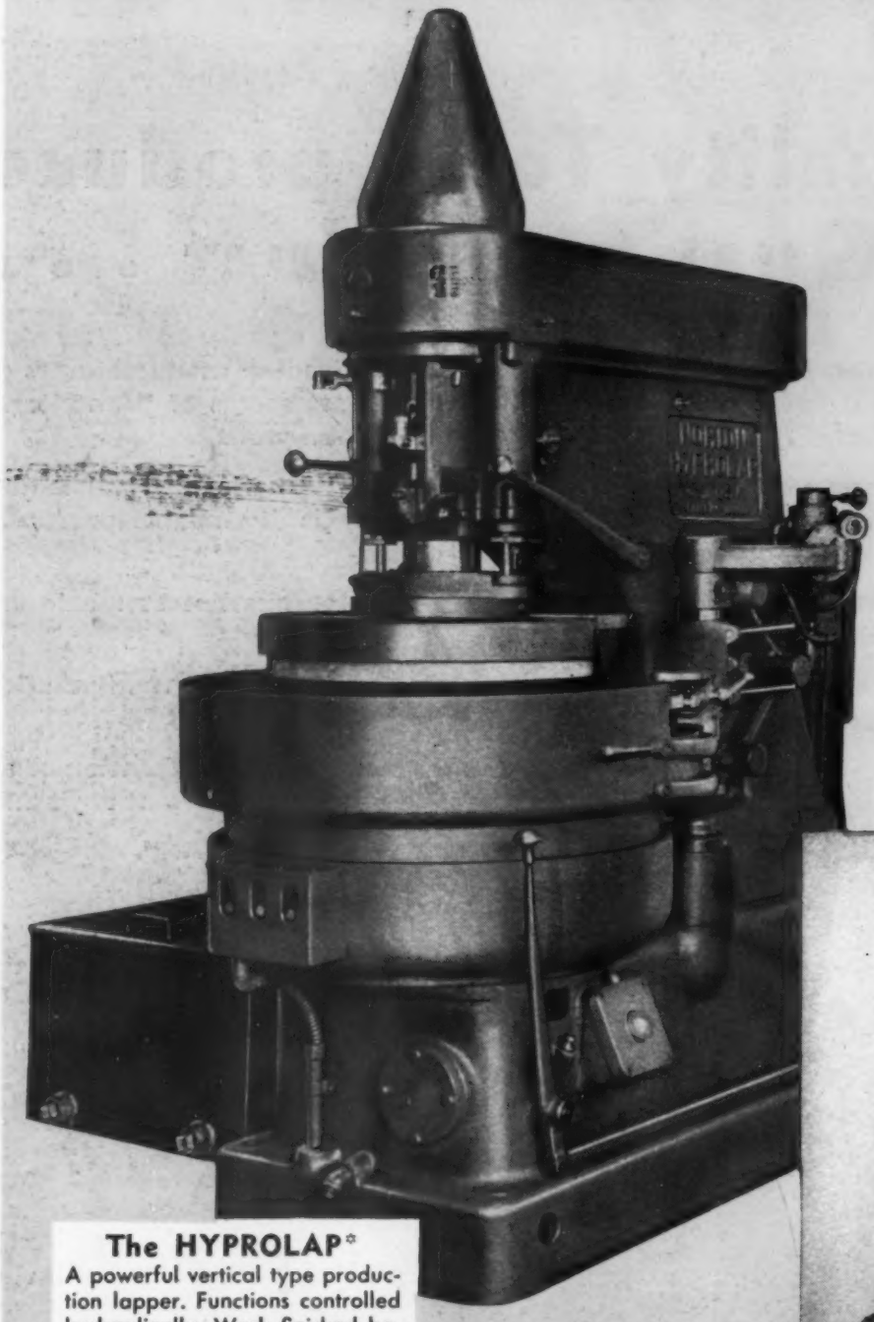
Finger-tip and direct-reading controls insure speedy manipulation for greater work production.

Anti-friction mounting of head on arm and convenient location of all operating levers mean less operator fatigue and more work at day's end.

For quality work at a profit your best bet is "AMERICAN".

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Put Precision on a Production Basis..



The HYPROLAP*
A powerful vertical type production lapper. Functions controlled hydraulically. Work finished between bonded abrasive laps.

Type No. 10-U
The smallest of the vertical lappers and a universal machine which does both flat and cylindrical lapping, using cast iron laps.

NORTON GRINDERS and Lappers

*Trade-marks Reg. U. S. Pat. Off.

with NORTON LAPPING MACHINES

NORTON has a complete line of lappers —they range from the powerful Hyprolap* machine for large flat and cylindrical pieces to the small Universal 10-U, widely used in the manufacture of plug gages and size blocks. In addition there are special lapping machines built for finishing crankshafts and camshafts. All are rugged, productive machines capable of finishing surfaces within extremely close tolerances. They are easily operated and easily maintained.

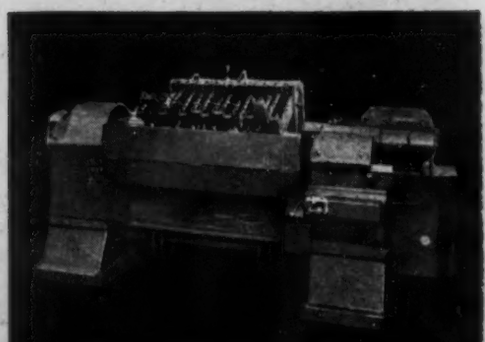
Individual catalogs are available on the various types of Norton Lapping Machines.

Tell us what you are interested in lapping.

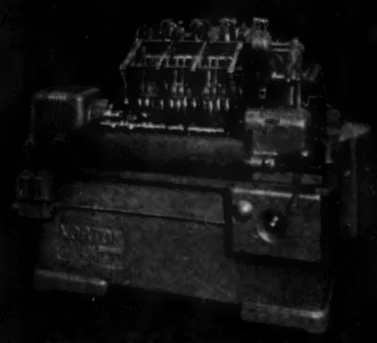
NORTON COMPANY, Worcester 6, Mass.

Distributors in All Principal Cities

M-525



Type 40 Crank-O-Lap*

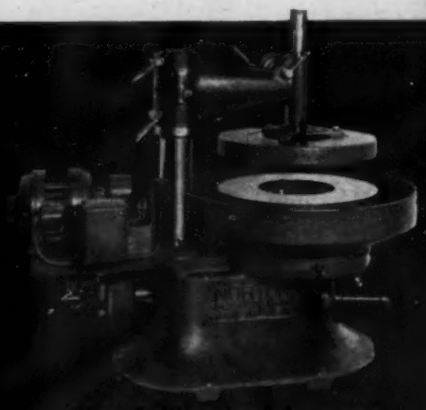


Type 30 Cam-O-Lap*

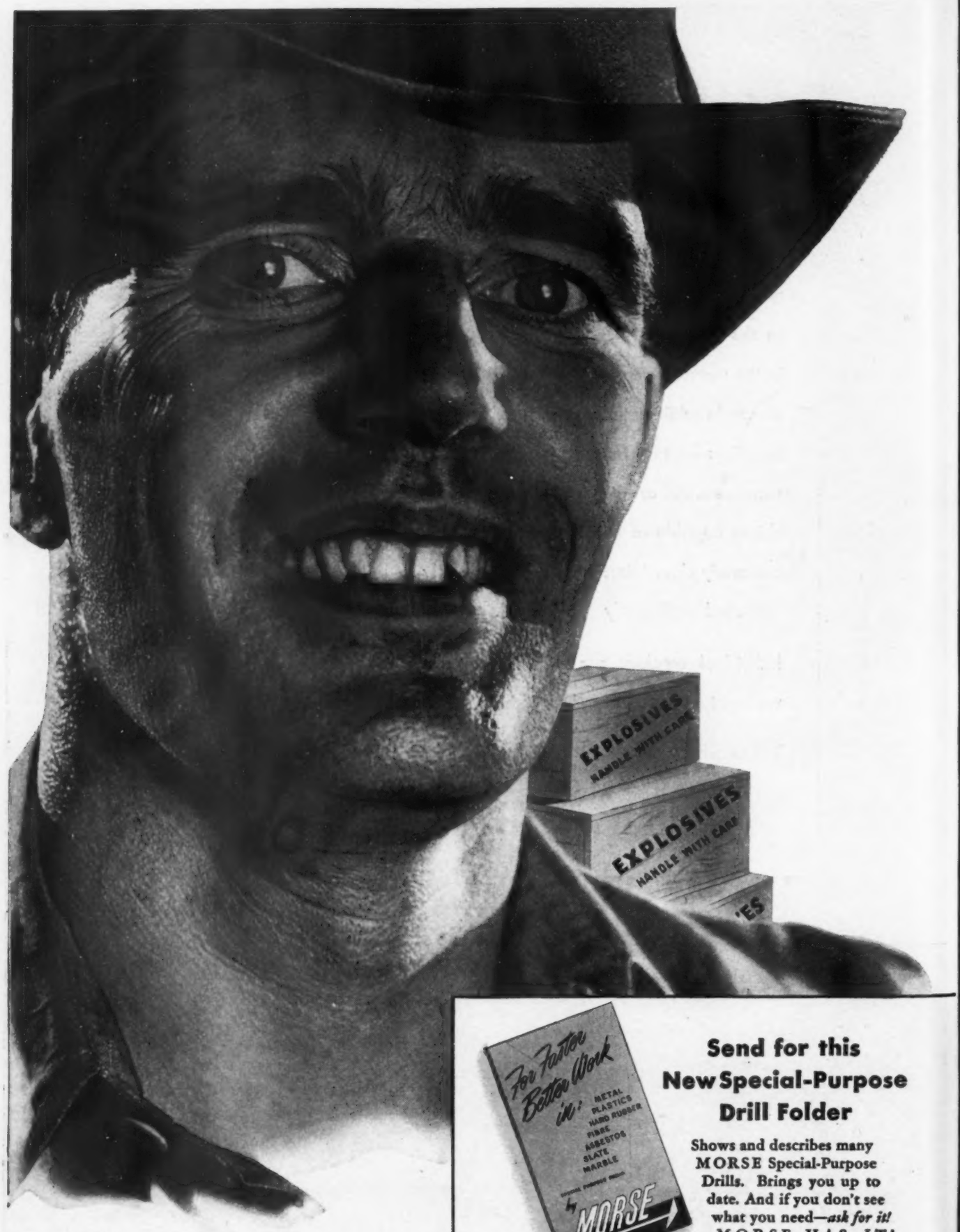
Simplex Lapper

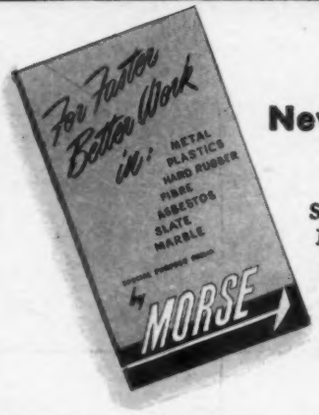
No. 2 Hand Lapper

Single Spindle Rotary Seal Lapper



No. 2 Vertical Lapper





Send for this New Special-Purpose Drill Folder

Shows and describes many MORSE Special-Purpose Drills. Brings you up to date. And if you don't see what you need—*ask for it!* MORSE HAS IT!

"It's T.N.T"

. . . but MORSE found the way to *Drill it* without Striking a Spark

DEADLY PROBLEM was this one! But Morse . . . drawing on the lengthiest drill experience in the world . . . developed a special non-sparking drill of phosphor bronze that pulls the dreaded teeth of T.N.T—at least as far as drillers are concerned.

Now this follows: No matter what *you* drill . . . asbestos, T.N.T., steel or zylonite . . . there is *one* Morse Drill (of the right type, metal, diameter, length and twist cut) that will do your job better than any other. *Are you using it now?* Ask your Industrial Supply Distributor for a Morse recommendation.

Accuracy, Quality, [illegible] Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

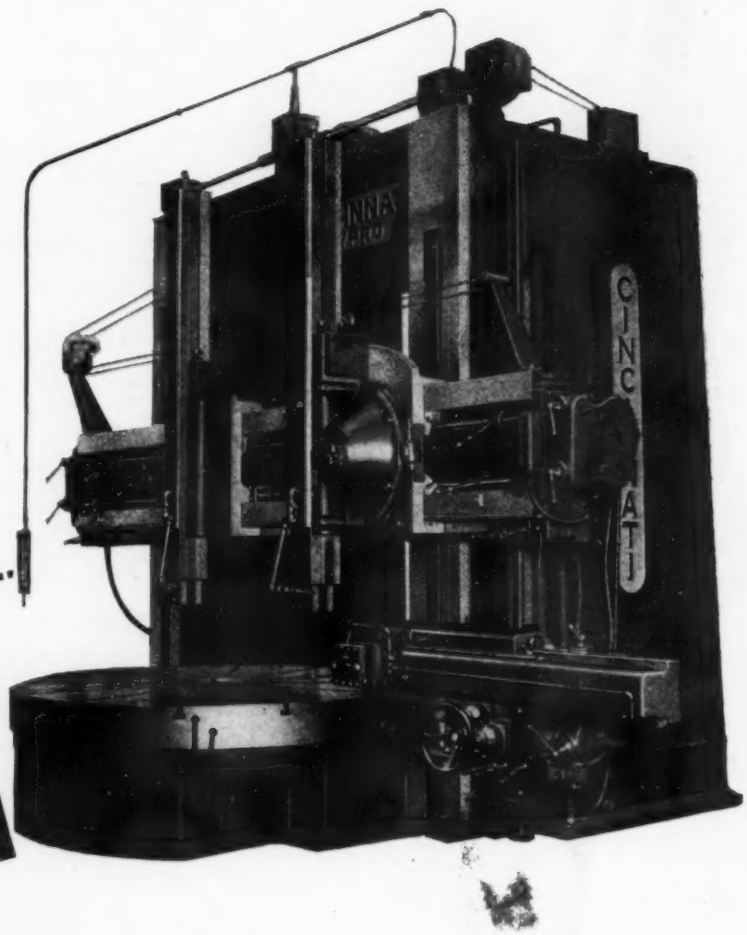
NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

FINE INCREMENT SPEED CONTROL—Multi-point, fine increment motor rheostat controlled from operators position, eliminates compromise speed settings, inevitable with conventional gear changes. Exact cutting speed assures maximum production.

TAILORED TABLE SPEEDS—On work of varying diameter table speed may be continuously adjusted for maximum production, without stopping table, without shifting gears and while tools are cutting.

SET UP TIME REDUCED—Fine increment table inching control in forward and reverse directions with dynamic braking.

OPERATOR'S FATIGUE ELIMINATED — Complete control of all motors from single accessible pendant station, plus absence of table clutch and brake shifting lessens operator's fatigue.



Effortless Control
COMES WITH
CINCINNATI
HYPRO
SPEED CONTROL

CAN NOW BE FURNISHED ON ALL HYPRO BORING MILLS IN FOLLOWING SIZES:

54″—64″—6′—7′.
7′ widened to 8′. 8′—10′—12′.
12′—16′ Extension type.

THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

President Buckley of Bell Telephone Laboratories describes a television tube no bigger than a pocket flashlight.

get ready with CONE for tomorrow

The new building of the American Stone Company in St. Louis will have an electrically controlled car suspended from the roof for washing windows.

get ready with CONE for tomorrow

A plastic molding press weighing 17 lbs. and costing about $30 is offered by N. R. K. Manufacturing & Engineering Company of Chicago.

get ready with CONE for tomorrow

International Business Machines has a 6-key Braille typewriter and will give away the first thousand to blind veterans.

get ready with CONE for tomorrow

Du Pont has announced a new, improved translucent "metallic" lacquer for automobiles called "Metalli-Chrome"

get ready with CONE for tomorrow

Two former military pilots have established American Flyaway Service, at Dayton, Ohio, to deliver personal aircraft from manufacturers to dealers.

get ready with CONE for tomorrow

On its longest over-water run, Oakland to Honolulu, Naval Air Transport Service is landing its planes within 18 minutes of their schedule.

get ready with CONE for tomorrow

In the upholstery plant of Fisher Body, the annoyance and danger of static electricity was eliminated by humidification. An incidental benefit was reduced absence due to colds.

International Harvester is establishing a manufacturing research center with 350 men chosen from its plants all over the country.

get ready with CONE for tomorrow

Westinghouse has a bacteriacidal ultra-violet lamp to insert in milk cans that reduces bacteria count 96% in one minute.

get ready with CONE for tomorrow

The 6-mile canal dredged to supply the Dow magnesium plant at Velasco, Texas, with sea water is also serving as a freight artery.

get ready with CONE for tomorrow

Tucson Laundry Company has started twice-a-week laundry pick-up service by air over a distance of 60 miles.

"ENIAC", the electronic computor developed for the Ordnance Department, can do 100 man-hours of mathematical work in two hours. It is expected to revolutionize the mathematics of engineering.

get ready with CONE for tomorrow

American Optical Company has developed a sight-testing instrument which will make 14 vision tests in three minutes.

get ready with CONE for tomorrow

Beech Aircraft is developing a 6-passenger automobile with a 90-horsepower air-cooled engine that drives a generator powering separate electric motors on the wheels.

get ready with CONE for tomorrow

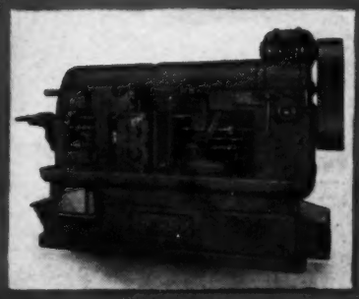
Martin Senour Company has developed a method of paint mixing that will produce 1000 tints with accuracy from 6 basic colors. The idea is being tested at a "paint bar" in a metropolitan department store.

COMPLETELY

PROFITABLY

The brass fitting illustrated is machined on a ⅞" 4-spindle Conomatic in 6 seconds. For machining parts completely and profitably, purchase Cones.

Ask your CONE representative to show you our new color motion picture



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

22

by COLD FORGING

Above is a typical example of how parts of intricate form are manufactured by cold forging in high volume production at lowest possible cost.

Innumerable parts ordinarily produced by other methods can be cold forged. Tolerances as close as are required for most machined parts can be secured. For greater strength and durability is always assured. And frequently costs can be reduced materially.

If you have parts which can be produced by cold forging methods, Allied can give you the benefits of every practical advantage offered by this type of production. Send us your part prints. We will submit quotations promptly.

ALLIED PRODUCTS CORPORATION

DEPARTMENT 8-A

4612 LAWTON AVENUE
DETROIT 8, MICHIGAN

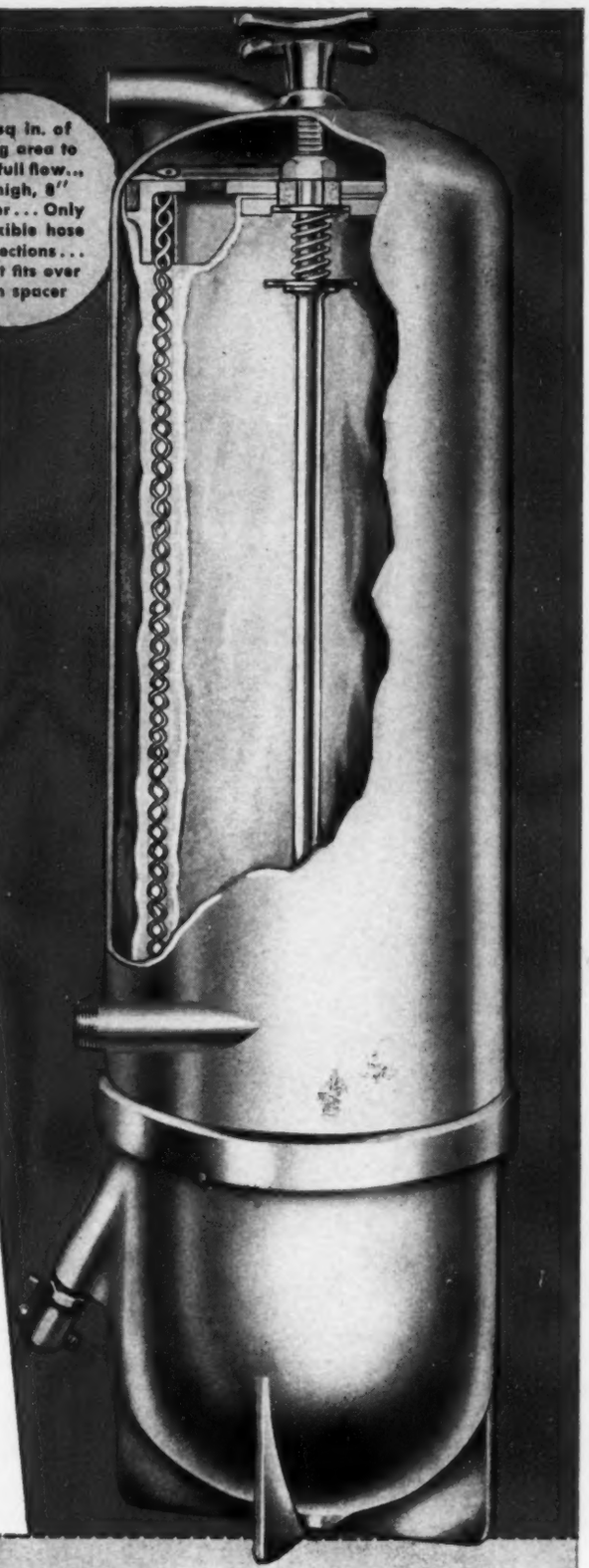
PRECISION · EXPERIENCE · DEPENDABILITY
ALLIED CORPORATION PRODUCTS

SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

WHAT TO LOOK FOR IN A

Unit-Type Coolant Filter

1000 sq in. of filtering area to handle full flow... 30" high, 8" diameter... Only two flexible hose connections... element fits over screen spacer



1. Positive action, handling full flow and removing all abrasive and metallic particles which would cause surface imperfections.
2. Low cost: initial cost of filter and replacement cost of element.
3. Low maintenance cost: fewest and quickest replacements of element.
4. Compact design.
5. Adaptable to any type of grinder.

AND WHAT YOU GET WITH CUNO'S NEW COOLANT-KLEAN

1. Users report extremely fine finishes — elimination of "pick-ups" on the work.
2. Lower initial cost, lower element replacement cost, than for most other filters.
3. Element replacement needed less often (coolant stays clean up to six weeks), takes less than five minutes. No "pre-coating".
4. Compact — only 30" high and 8" in diameter.
5. Can be applied to any type of grinder and almost any machine using a coolant or cutting oil. No alteration of machine. No filter aid, no extra pump, electrical work, plumbing, valves or by-passes.

Get the micro-finishes you want . . . lengthen wheel life . . . and save filter installation and maintenance cost . . . by using COOLANT-KLEAN on individual machines. Send coupon for new Bulletin 3110.

For Finer Finishes at Less Cost

KEEP FLOW ON "GO" WITH

CUNO

ENGINEERED FILTRATION

CUNO ENGINEERING CORPORATION
243 South Vine Street, Meriden, Connecticut.

Gentlemen: Please send information on your new COOLANT-KLEAN filter.

Name.....

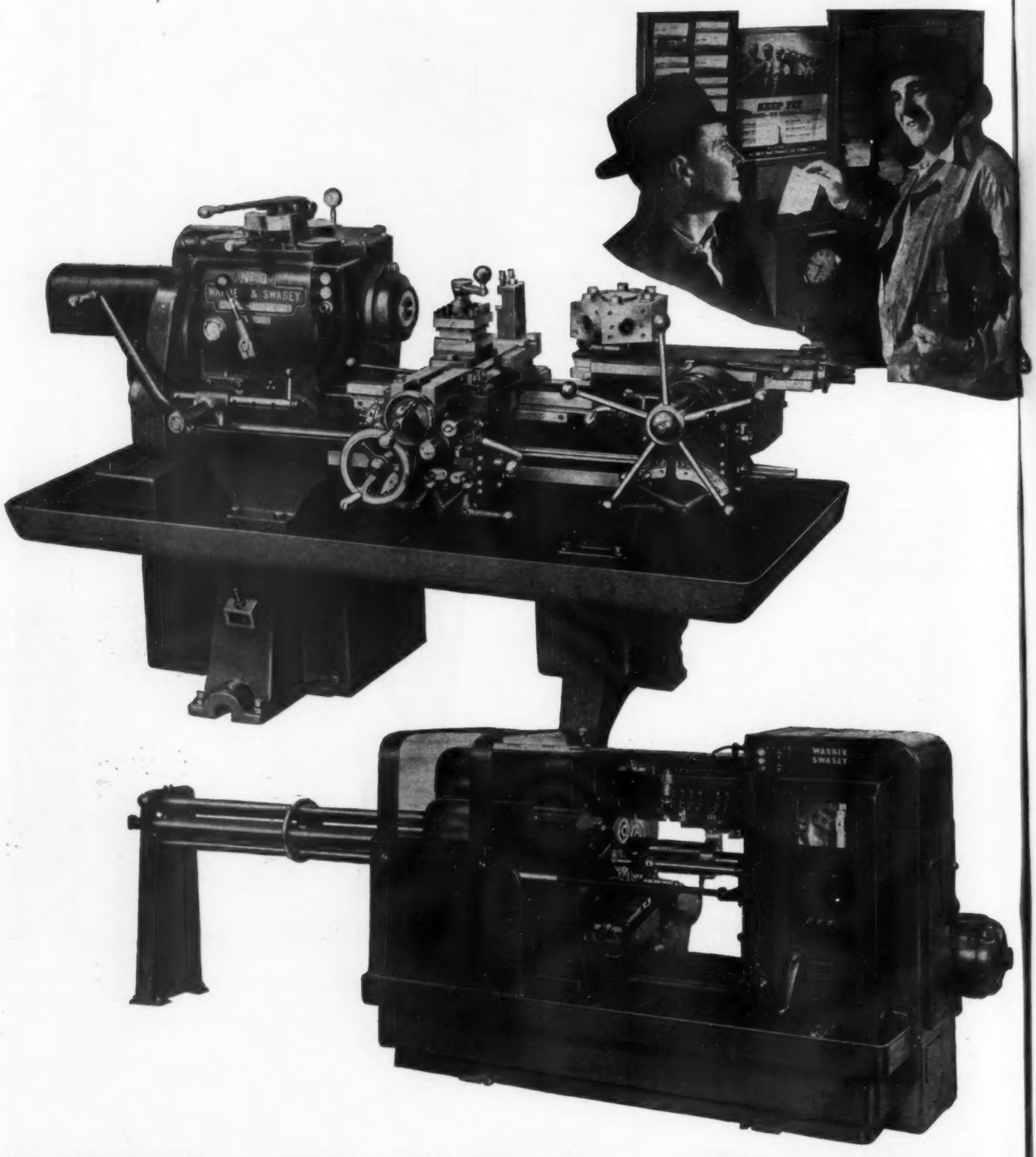
Company.....

Address.....

Position.....

Please have representative call ☐

Give your operators the *Chanc*o



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . . . WITH A WARNER & SWASEY

o be more productive!

EVERYONE SEEMS AGREED THAT THE WAY TO KEEP DOWN RISING PRICES AND PREVENT HARMFUL INFLATION IS TO INCREASE PRODUCTION WITHOUT INCREASING PRODUCTION COSTS

IN THE METAL turning industry, that puts it squarely up to the men running the machines. But can they be expected to work at a faster, harder pace—or work longer hours?

The logical solution is to provide them with newer, up-to-date machine tools that enable them to deliver more precision-finished pieces at the end of a normal working day without expending greater manual effort.

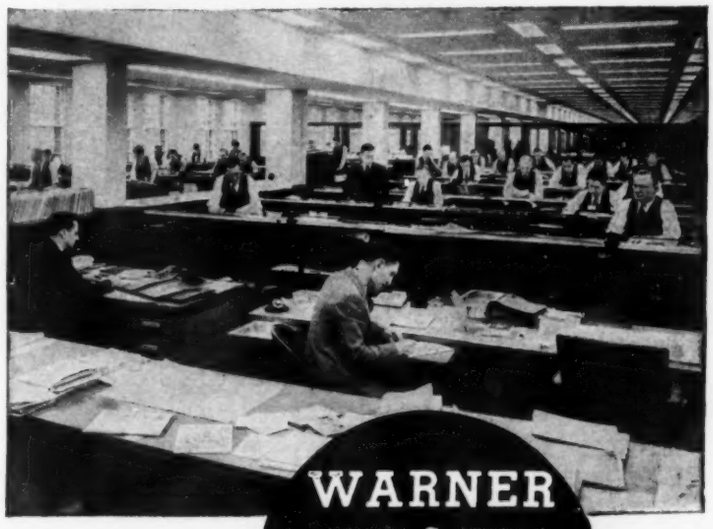
Over half of all machine tools in service in private industry are 10 years old, or older. We estimate that 54% of Warner & Swasey Turret Lathes in service in private industry are 10 years old, or older.

In many instances, replacement with new Warner & Swaseys will prove extremely profitable. In others, productivity can be greatly stepped up by installing time-saving and labor-saving devices such as power chuck wrenches, collet chuck boosters, open-type square turrets, etc.

Special tooling arrangements also offer ways to increase production.

We maintain a large engineering department devoted specifically to solving production problems through specially devised tooling.

It will pay you to investigate the possibilities of increasing production in your shop, either through new Warner & Swaseys, or by improved accessories and tooling arrangements for your present machines.



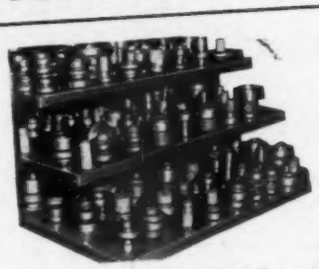
WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES. MULTIPLE SPINDLE AUTOMATICS. PRECISION TAPPING AND THREADING MACHINES

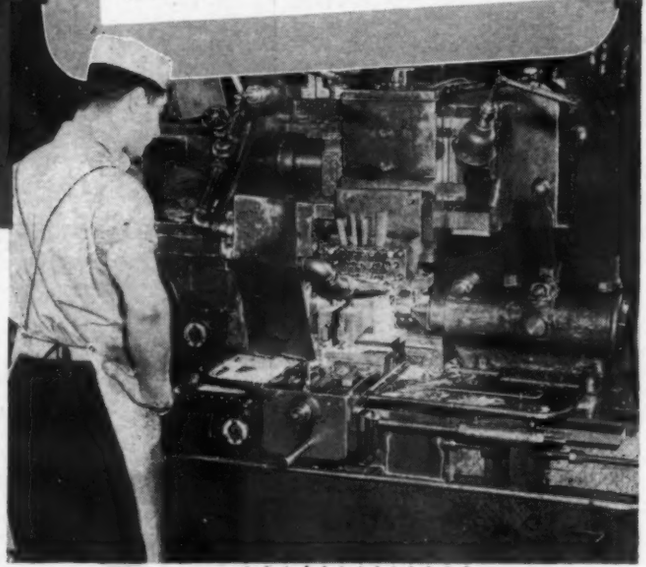
HERE'S YOUR ANSWER TO INCREASED PRODUCTION AND LOWER TURNING COSTS...

Multiple Tooling *plus* Automatic Cycling with a SUNDSTRAND AUTOMATIC LATHE

1 SHORT RUN TURNING



Over 250 gear blanks of different sizes and shapes are multiple-tool-turned on this Sundstrand automatic lathe. Prorated set up time and turning time per piece total 40% less than the machining time required for the previous method. Use of three tool slides made it possible to distribute the cuts more evenly and use heavier tool bits to utilize maximum cutting speeds and feeds. In this way a superior finish is produced, maximum production is obtained and tool life increased.



● Whether your turning problem is a mass production job running into thousands of pieces . . . a short run of as few as 25 pieces . . . or a special turning job, Sundstrand engineers will show you how it can be handled to advantage on automatic lathes with quick cycle changeover. They will also assist in designing the most profitable processing method for the job at hand.

All of the advantages of multiple tool turning are available for both short run and mass production work with Sundstrand lathes. When the nature of the work is such that these standard automatic lathes cannot be tooled to handle the part, our engineers recommend and design special automatic lathes. Described here are three typical cases in which Sundstrand "Engineered" production assisted plant engineers in designing a tooling method which resulted in lower turning costs.

MORE TURNING FACTS *Free*

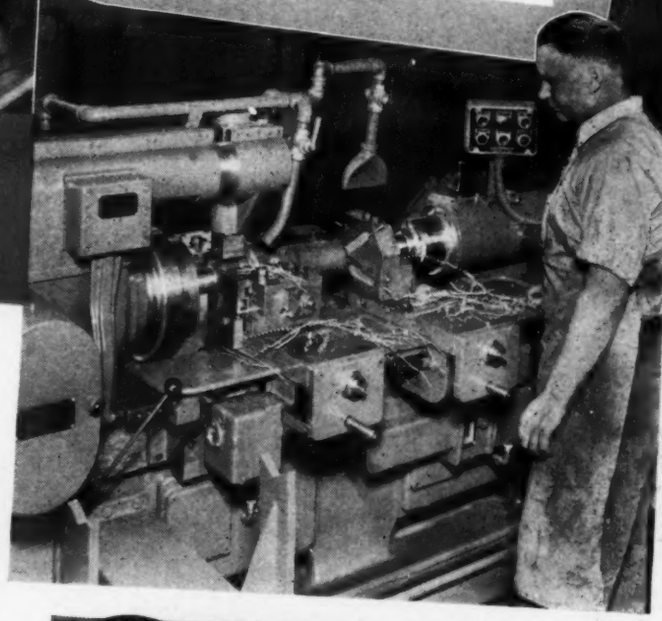
This 44 page booklet, crammed full of technical data and production information shows how to apply multiple tooling to countless turning jobs. Short-run, mass production and special turning jobs are all included. Write for your copy today. Ask for bulletin 151.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

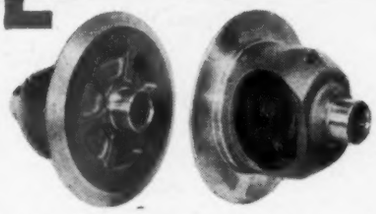
RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

3 SPECIAL TURNING

Special Sundstrand lathe equipped with two longitudinal feeding front carriages, two cross feeding rear tool slides and one special longitudinal feeding overhead tool slide. Thirteen T. C. tipped tools: rough and finish turn and form tube end, turn O. D. and rough and finish face and chamfer both sides of flange and turn, face and chamfer flange hubs.



2 LONG RUN TURNING



Here's automatic cycling for continued accurate reproduction of parts, ample power and rigidity for carbide tools, 250" per minute rapid traverse and simple, effective tooling for turning twelve surfaces in one cycle. This Sundstrand automatic lathe is equipped with two left-hand feeding front tool slides, one right-hand feeding front tool slide and one cross feeding rear slide to finish turn, face and chamfer a differential case. Twelve T. C. tipped tools complete the operation in one cycle.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES | SPECIAL MILLING AND TURNING MACHINES

Then he said to himself:

"Quit stalling...start rolling!"

Wherever there's a government jam, the finger of Bernard M. Baruch is usually called for.

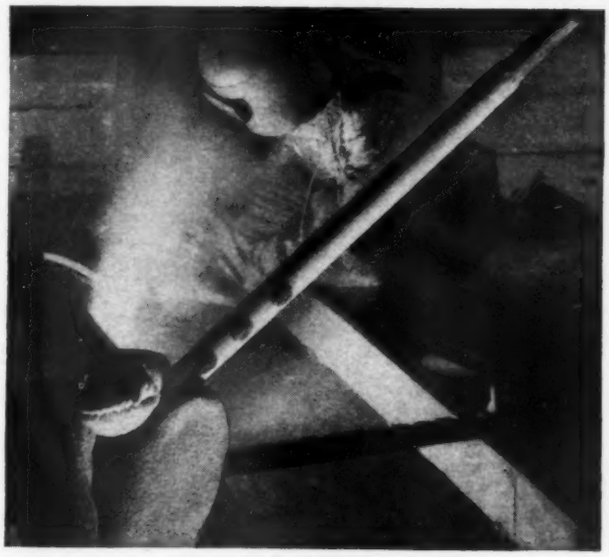
He has a facility for placing it on the weak spot . . . then using it to point the way out. For example, in his appearance before the House Banking and Currency Committee, he said:

> *"Increase production! This is the law and the prophets . . . Without it the rest of my suggestions are meaningless. So I say again . . . Increase production."*

And that is really pointing somewhat like this:

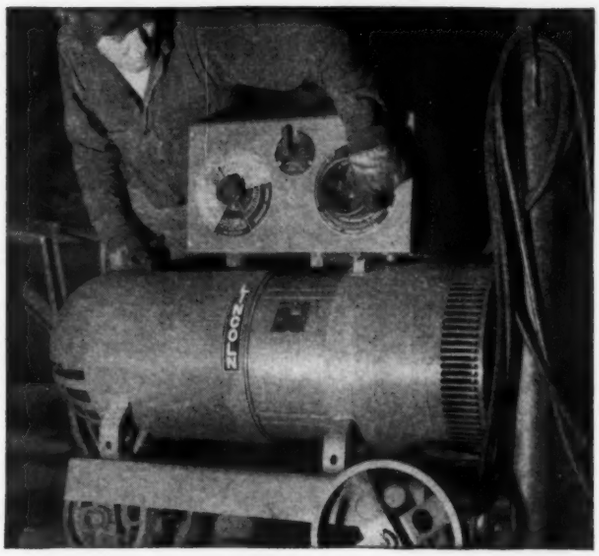
HERE, MR. BARUCH, **are two aids for the action you recommend:**

INCREASE PRODUCTION!



WITH BIG "FLEETWELD"

Where possible, position work for downhand welding. Fit up joint carefully. Use large "Fleetweld" Electrode, ample current and "Fleet-Welding" procedure. Speed increases of 25% to 75% are common by switching from "welding-as-usual" to this "get-up-and-go" technique. Full details in handy pocket manual, Bul. 444. Free on request.



WITH AMPLE "SHIELD-ARC"

With amperage supplied by the Lincoln "Shield-Arc" Welder, you get extra speed because you can select the right TYPE of arc and the right arc INTENSITY to match every thickness of metal and every welding condition . . . easily, quickly. Simplifies operation because control is self-indicating and continuous. Full details in Bul. 412.

THE LINCOLN ELECTRIC COMPANY • DEPT. 293 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

NO MATTER WHAT YOUR PRODUCT MAY BE . . .

Ex-Cell-O's Complete Parts Production Facilities May Be of Practical Help to YOU!

Few people realize how extensive are Ex-Cell-O's facilities for the speedy production of quality parts. Yet the same wide experience, the engineering "know-how", and the outstanding accuracy that distinguish Ex-Cell-O machine tools and cutting tools wherever they are used . . . in many parts of the world . . . go into Ex-Cell-O's production parts manufacture.

If your product requires carefully machined parts, the chances are Ex-Cell-O can work with you to your economical advantage. Contact Ex-Cell-O today, either at the Head Office in Detroit or through any one of the 27 other leading industrial centers where Ex-Cell-O field engineering representatives are located.

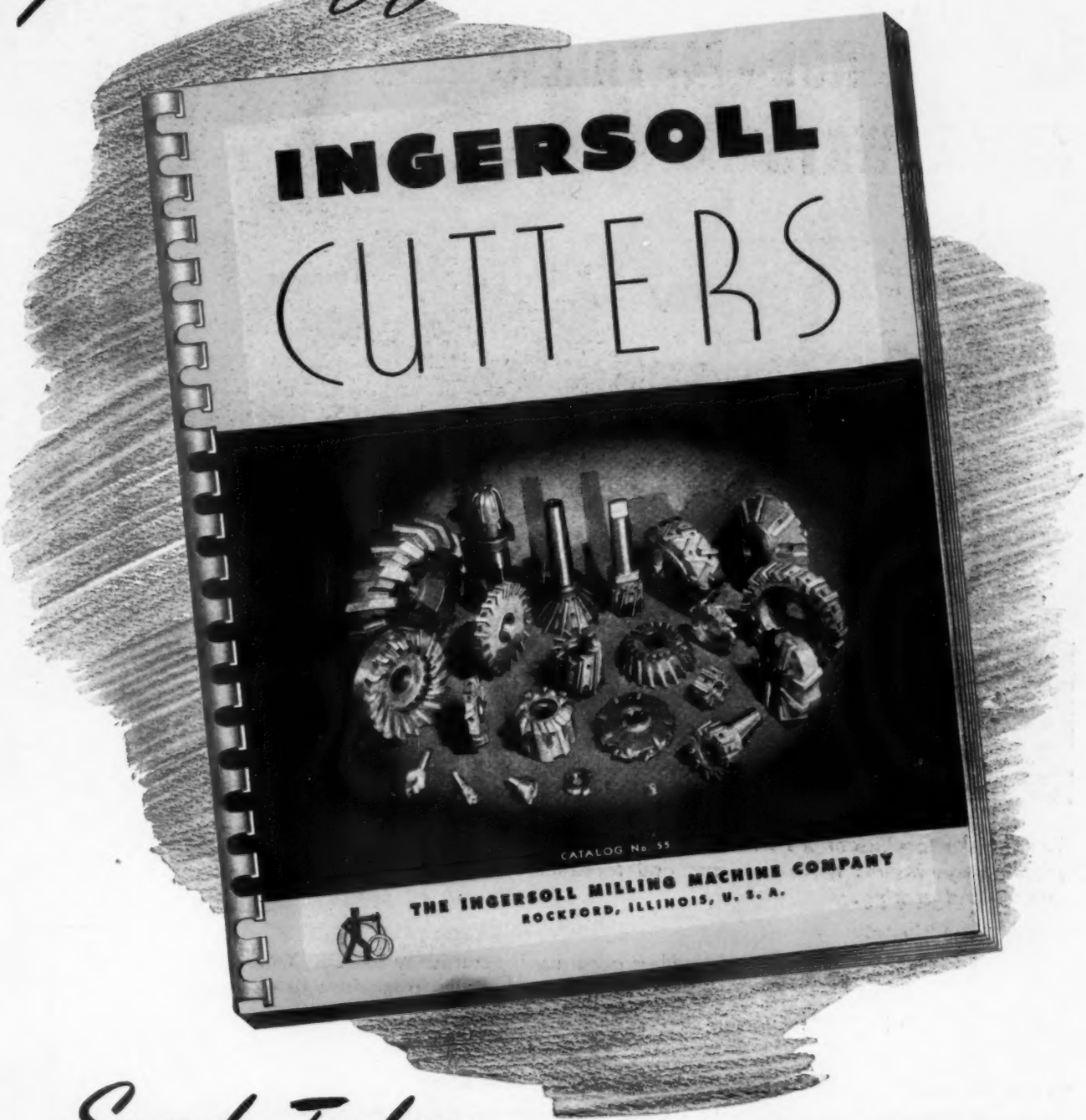
Folder illustrating Ex-Cell-O's complete parts production facilities will be sent you upon request. Write or wire Ex-Cell-O today and ask for Ex-Cell-O Bulletin No. 36151.

EX-CELL-O CORPORATION • DETROIT 6

XLO

EX-CELL-O *for* PRECISION

Just Off the Press!



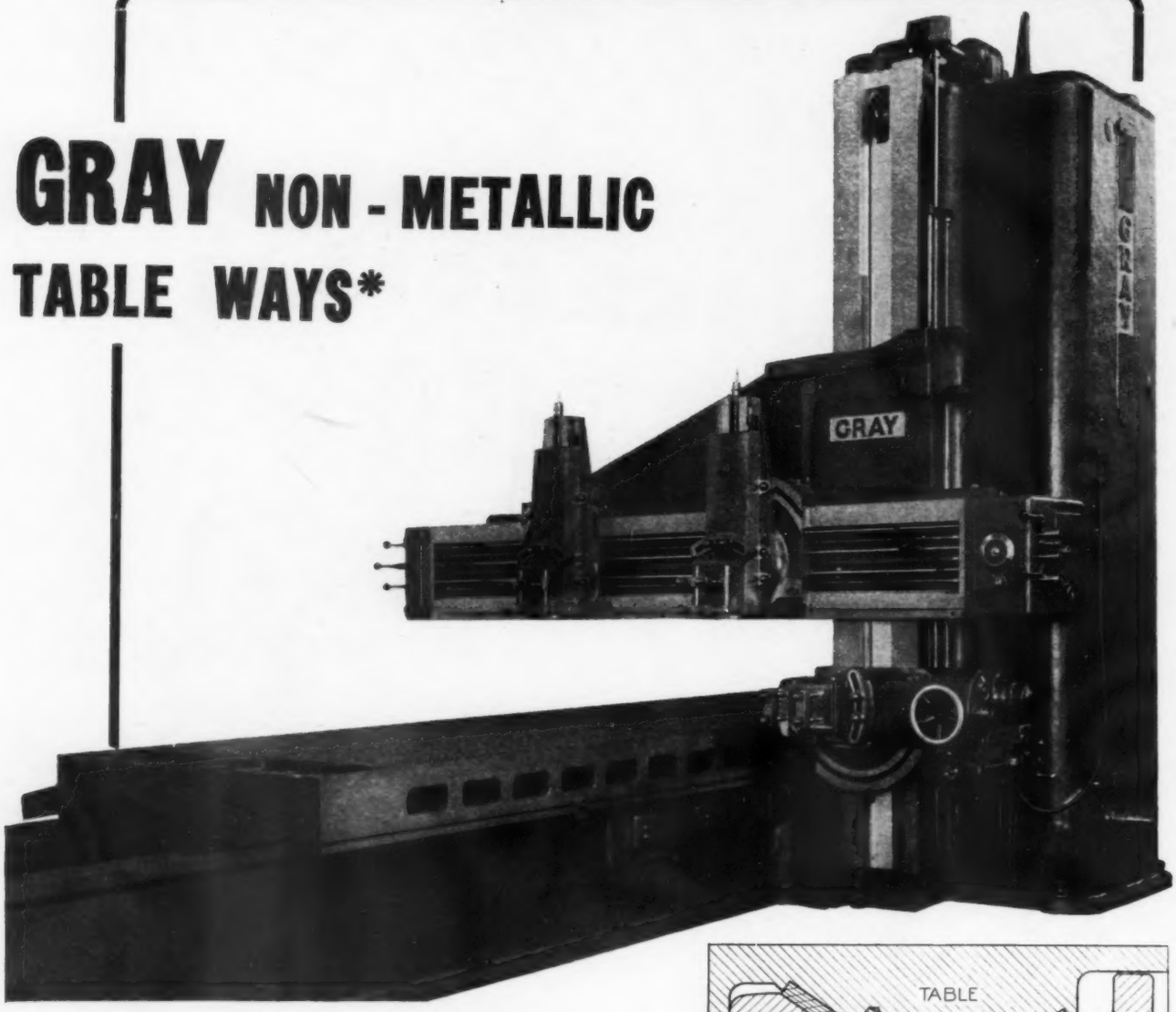
Send Today... FOR YOUR COPY

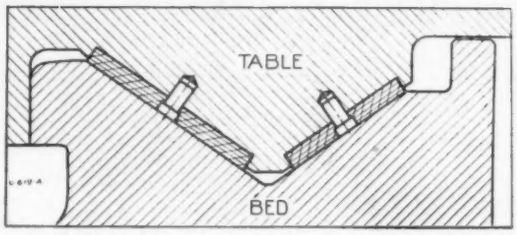
of this new Ingersoll Cutter Catalog

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

Builders of Inserted Blade Milling and Boring Tools

GRAY NON-METALLIC TABLE WAYS*





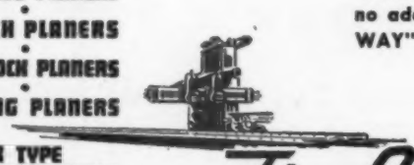
The very low coefficient of friction of the GRAY laminated plastic ways insures minimum wear and freedom from cutting and scoring.

Years and years of faultless accuracy is assured by the GRAY Non-Metallic Table Ways.* You can't afford to gamble with a machine as expensive as a planer—play safe—specify GRAY Non-Metallic Table Ways.*

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

Remember

"A Machine Tool is no better than its ways. There is no adequate substitute for the GRAY NON-METALLIC WAY"



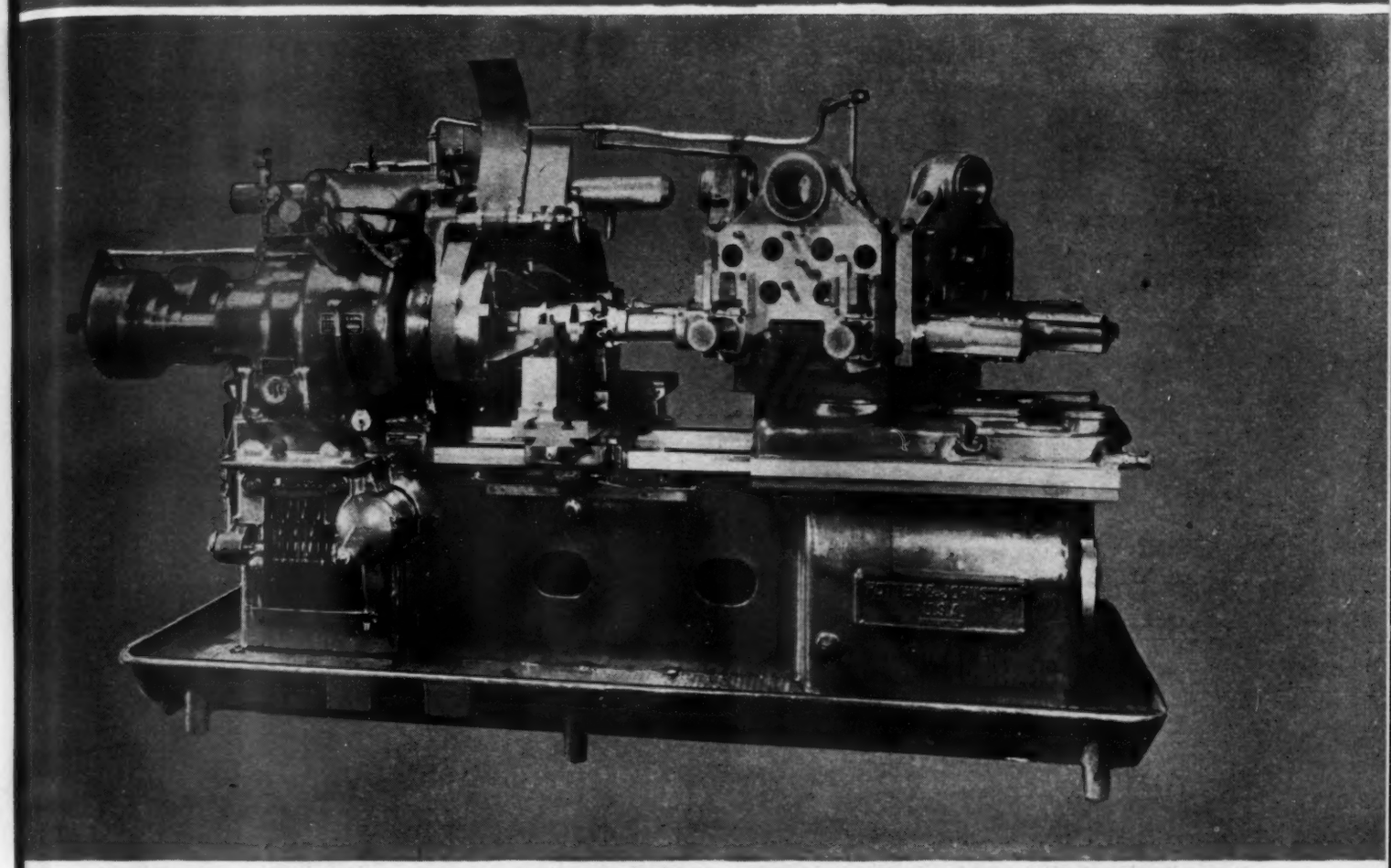
*Protected by Patent #2378343 and Pat. Pending

The G.A. GRAY Co.

CINCINNATI 7, OHIO, U.S.A.

Sold in Canada by Upton, Bradeen and James Ltd. ● **Sold in Latin America by Machine Affiliates.**

Two Spindle Output Results in Outstanding Productive Capacity



with the P&J 5D2 POWERFLEX

The P&J 5D Powerflex is fully described, including detailed specifications, in Bulletin 123 available on request.

This machine is the logical development of the single spindle Model 5D Powerflex and is designed to meet the need for a machine that could assure an output greatly in excess of that possible with a single spindle unit. That this objective had been achieved is attested to by the outstanding performance of these machines on a wide range of work in leading metal working plants.

The P&J 5D2 Powerflex is a powerful machine, rigidly constructed. It provides four automatic changes of spindle speed while under cut as well as three selective automatic changes of feed. Other features include automatic binding of turret following index, direct cross slide action and a constant high speed motion to cross slide and turret slide.

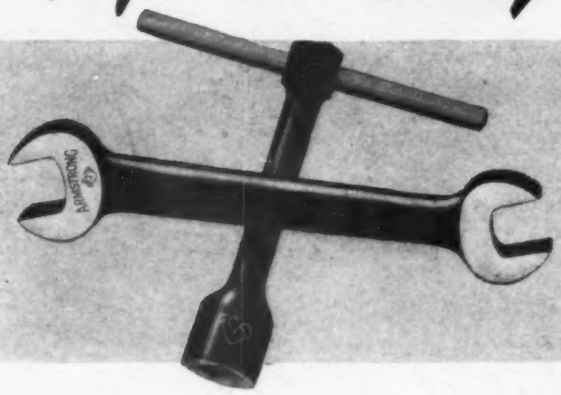
THREE MODELS

	Cross Slide Travel	Swing over bed	Dist. between Spindles	Turret faces
5D 2-9"	5"	21½"	10½"	5 or 6
5D 2-12"	5"	23"	15½"	5 or 6
5D 2-15"	5"	28"	15½"	5 or 6

POTTER & JOHNSON MACHINE CO., PAWTUCKET RHODE ISLAND

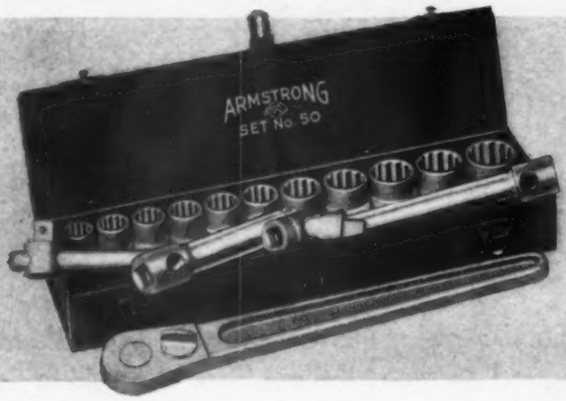
ARMSTRONG

Top Quality WRENCHES



Armstrong Drop Forged Carbon Steel Wrenches including 19 Different Types.

Armstrong Drop Forged Alloy Steel Wrenches including 12 different types.



Armstrong Alloy Steel Detachable socket wrenches and driving units . . . a complete assortment of sets.

For Construction, Armstrong Drop Forged Ratchets. Construction and Structural wrenches in both Carbon and Alloy.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave. Chicago 12, U. S. A.

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.

Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.

The Wade No. 8-A Toolmaker's Lathe Guarantees

highest returns on your investment...*because*

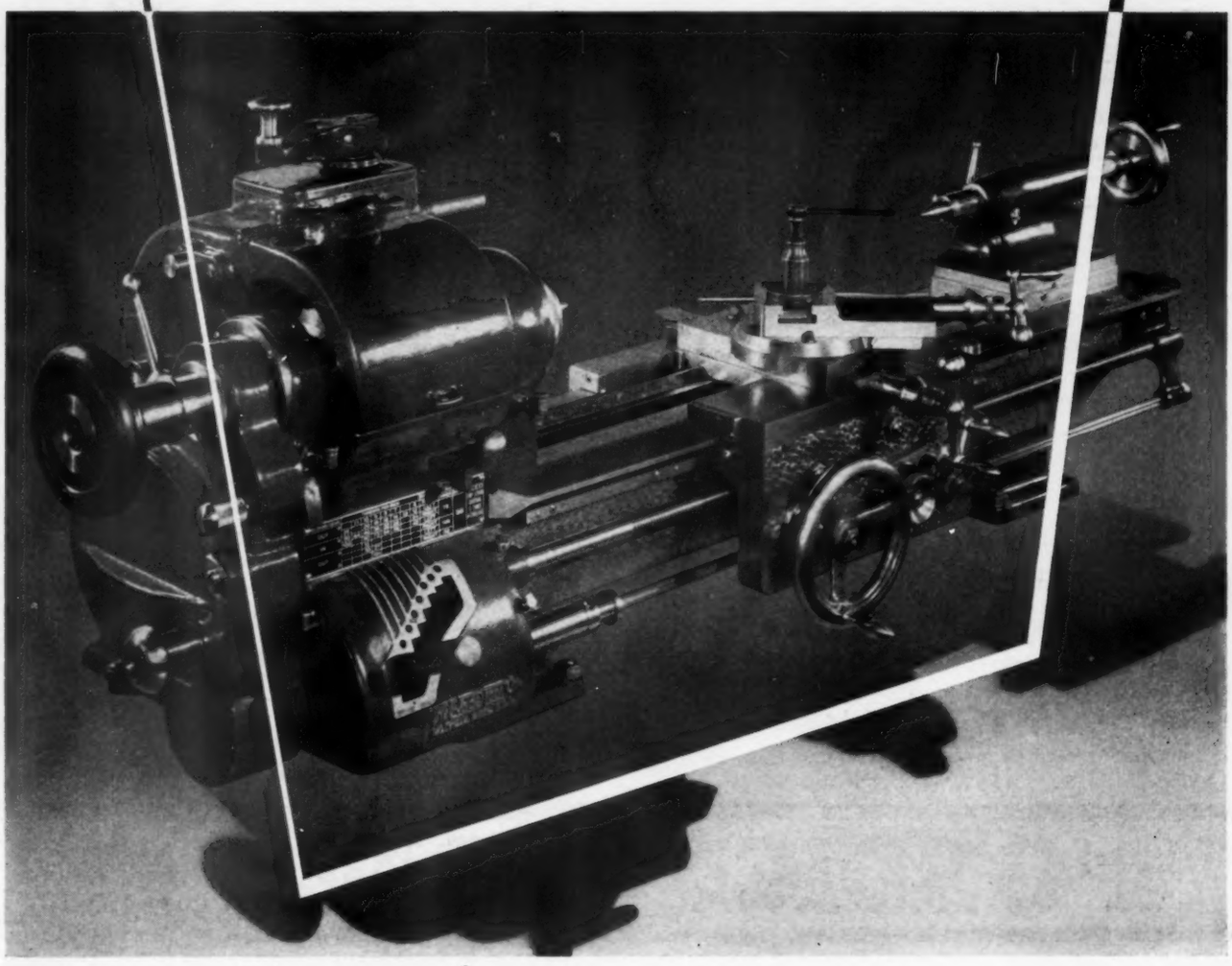
We guarantee that the Wade No. 8-A Toolmaker's Lathe will out-produce and out-perform any make of lathe within its size and capacity!

We back up this guarantee with such 8-A features as instant reversing—instant Hi-Lo speeds (3:1 ratio)—vibrationless operation—highest speeds—enduring accuracy—finest finish—most advanced spindle bearing design—a complete line of tools and accessories for utmost versatility. For the complete story and detailed specifications, write for catalog.

Wade

The Wade Tool Co.

53 RIVER STREET
WALTHAM 54, MASS.



For low Cost

DRILLING
REAMING
TAPPING

FOSDICK

High Speed

DRILLS

• Illustrated are two single spindle Fosdick High Speed Drills in a tool and die shop. These rigid, accurate high speed drills are particularly suited to tool and die shop work requiring—drilling—reaming—tapping and similar operations on holes up to 1¼" diameter.

The machines are furnished with any number of spindles up to six depending upon your job requirements. There are six spindle speeds ranging from 225 to 1800. The spindle is provided for multiple drill heads. To reverse the spindle, an extra contactor is added to the controller providing an excellent design for tapping of all descriptions.

If you are interested in high production low cost drilling—reaming and tapping investigate the Fosdick High Speed Drill.

Write for Bulletin H.S.A. for full details of construction, combinations available and specifications.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

HARDINGE
ELMIRA, N.Y.

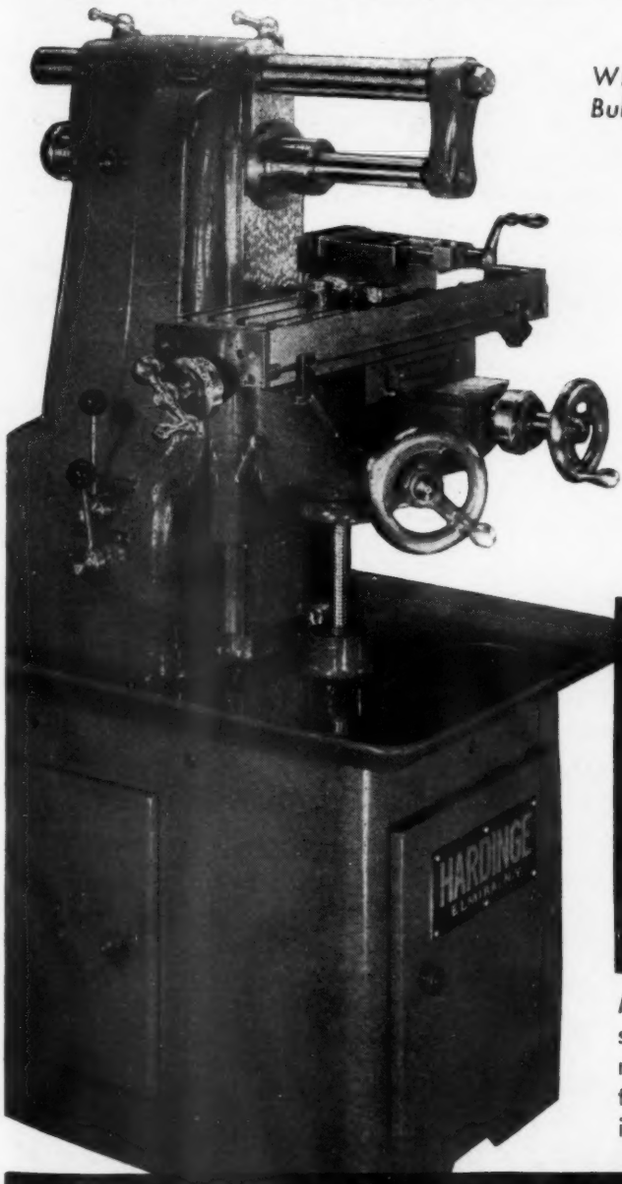
HIGH SPEED PRECISION MILLING MACHINE

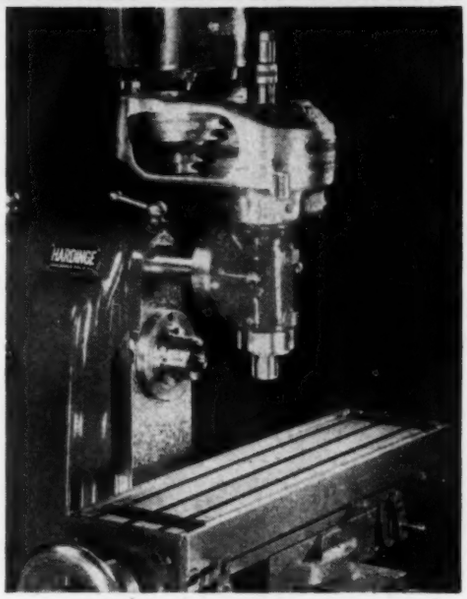
FOR

TOOL ROOM AND LABORATORY

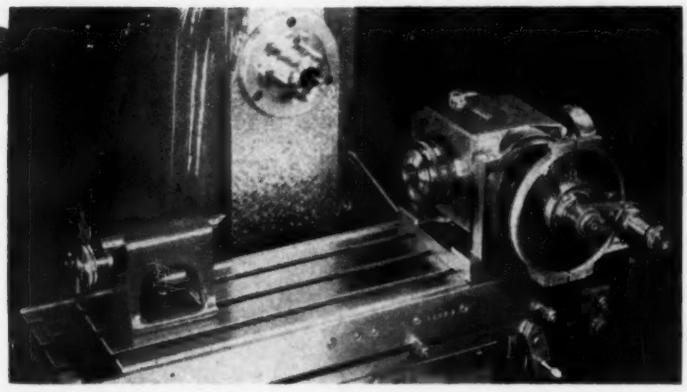
Tool room and laboratory work, because of the variety, demands useful milling machine attachments. Hardinge knows this. Illustrated are two attachments, in addition to the arbor and vise shown below. Other attachments are: Power feed for table; oil coolant facilities; 360° swivel base, also right angle base for dividing head; taper hole collets, as well as regular collets; step chucks and jaw chucks for dividing head.

Write for Bulletin TM-UM





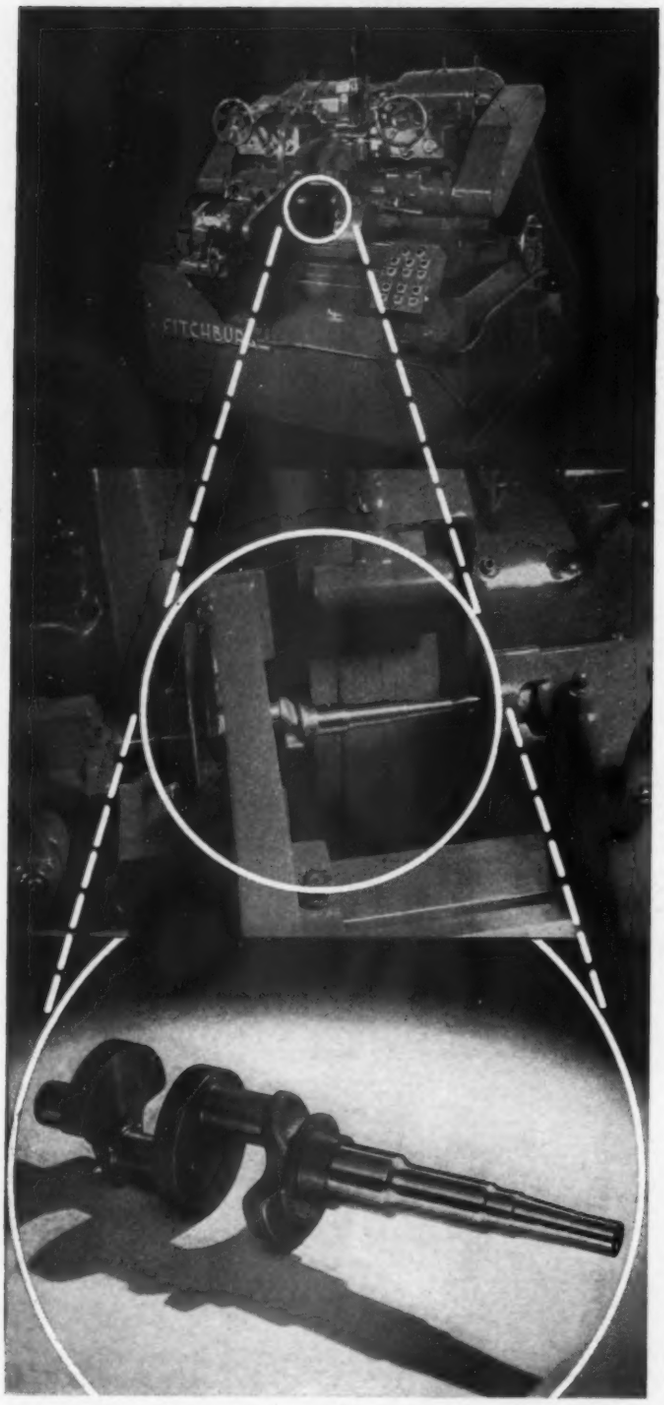
This attachment provides high speed vertical milling. Has separate motor driven preloaded ball bearing spindle —eight selective speeds from 465 to 4250 r.p.m. — takes standard ½" capacity collets. Vertical head swivels to angular settings.



Modern design universal plain dividing head and tailstock. Designed to match the precision qualities of the machine. Features are: Preloaded ball bearing spindle; takes standard 1" capacity collets same as used in horizontal spindle; and high speed indexing, 4 to 1 ratio.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



PRECISION

Grinds 6 Central Diameters at one time!

In this latest example of Fitchburg's specialization in multiple-precision grinding for mass production, two standard automatic-cycle Fitchburg Bowgage Wheelheads are mounted on a special base. A center drive attachment is used.

One form-dressed wheel grinds *five diameters* in a single plunge-cut while the other wheel grinds the sixth diameter.

The operation of the machine is very simple. It consists of loading the work and pressing the start button. The Bowgage Wheelheads go through their automatic cycle simultaneously: rapid traverse to the work . . . proper grinding feed . . . spark out . . . and rapid return—and *all six* diameters are precision-ground with *fine finish* at one time.

All six diameters are ground *within* the time it would ordinarily take to grind *one*. In addition to saving the time required for the five other operations, all the dimensions are accurately controlled in correct relation to each other—thereby greatly reducing the chance for work spoilage.

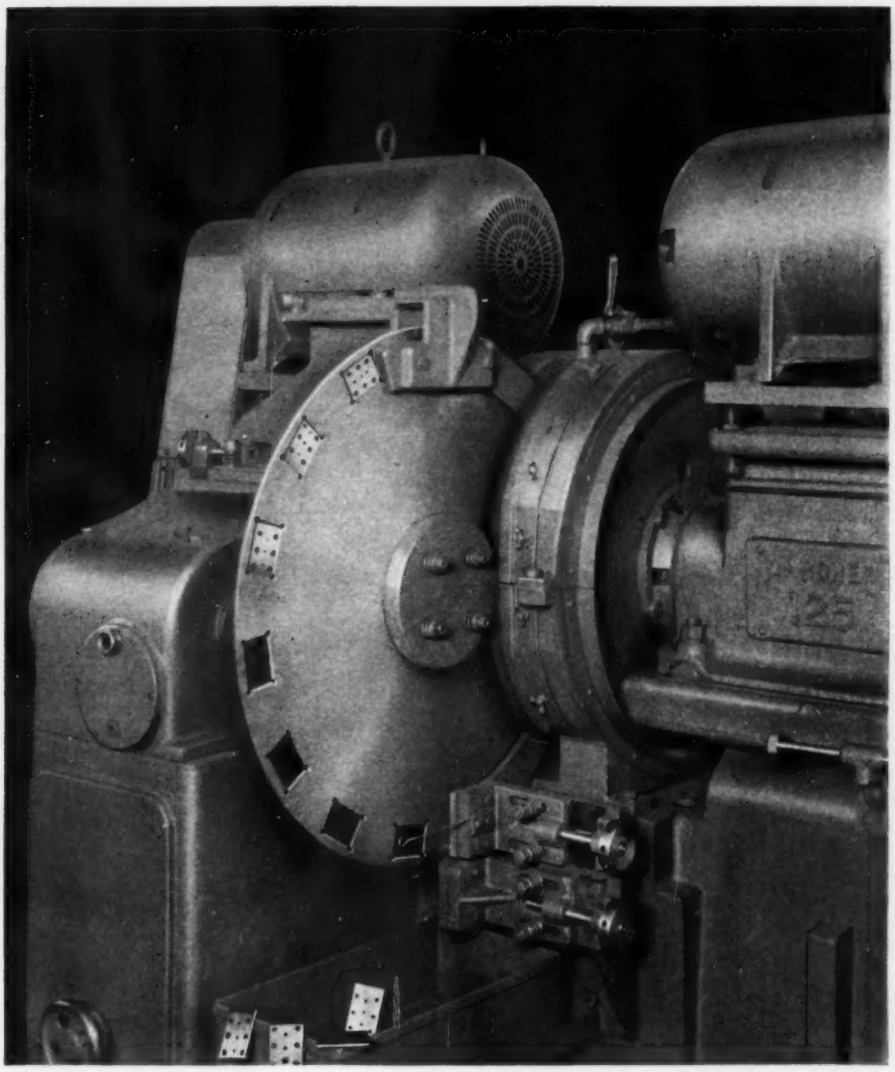
Fitchburg automatic, multiple-precision, mass-production grinding equipment is saving hours and dollars in many large and small industrial plants.

Call on the specialized experience of Fitchburg's grinding engineers. They can show you how to dig hidden profits out of your grinding operations. There is no obligation.

Send for new fully illustrated book—write for it on your business letterhead—it will be mailed free.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders

Grind ▶|TWO|◀ Surfaces at a Time on GARDNER DOUBLE GRINDING ..... Not ▶|ONE Face as on Conventional Surface Grinders



PRODUCTION time and labor is being cut to half that required by conventional grinding methods and even more — through grinding *both* surfaces of many parts at one time on GARDNER DOUBLE GRINDERS.

One excellent example is the steel refrigerator compressor plates here being ground on a Gardner No. 125-26" Double Spindle machine. The plates are fed into the rotary carrier by hand, but are unloaded automatically. The grinding is accomplished accurately and speedily enough to meet the high production and close tolerances required in the refrigerator industry.

PRODUCTION: 10 to 12 plates per minute, per cut, depending upon operator's ability.

TOLERANCES: .0005"-.001" for parallelism and .001"-.002" for uniformity, roughing cut. .0005"-.00075" for parallelism and .001"-.002" for uniformity, finishing cut.

STOCK REMOVAL: .020"-.025" overall (roughing) soft. .006"-.008" overall (finishing) hardened.

Give a Thought To GARDNER-GRINDING In Your *Modernization* Plans!

Write for Data on GARDNER Double GRINDING!

GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

SUPER

Solid Carbide and Carbide Tipped TWIST DRILLS

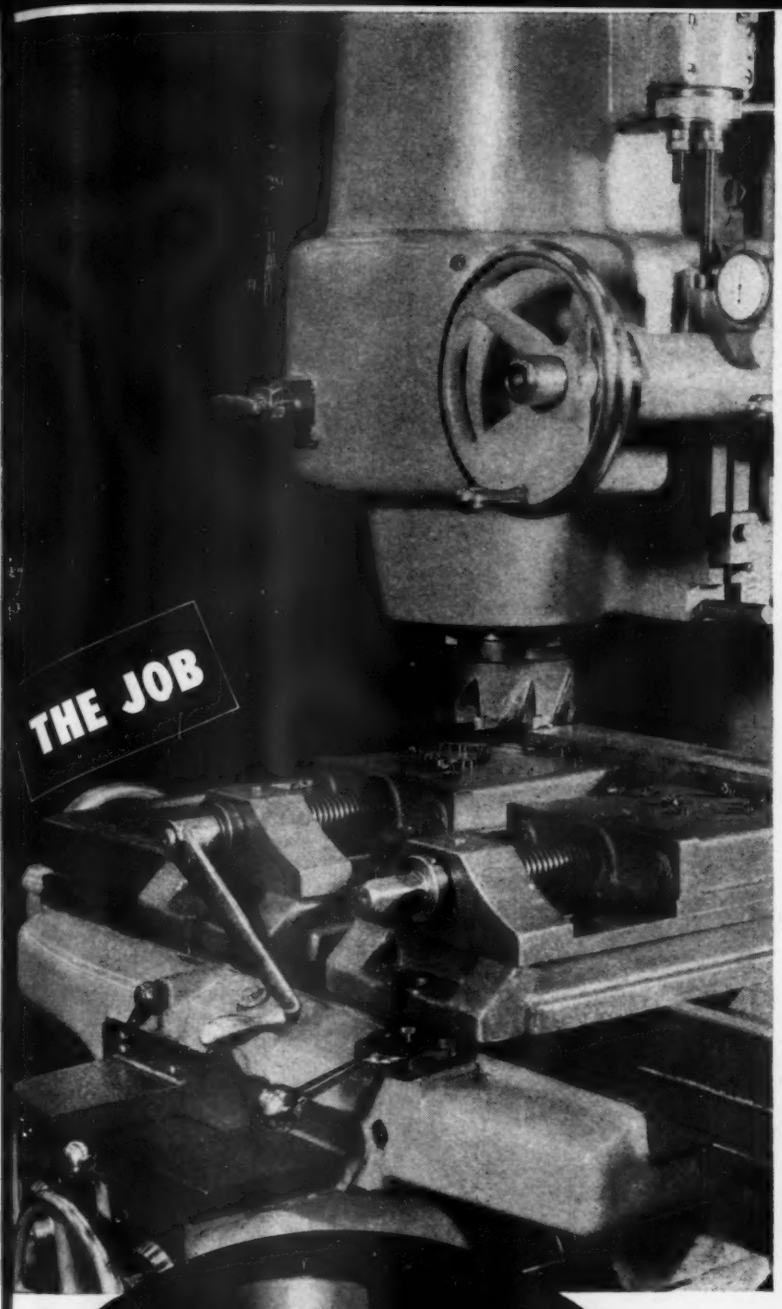
For drilling in abrasive materials such as plastics, non-ferrous metals, etc., where long-wearing qualities are needed and risk of breakage is low. On many jobs in the classifications outlined above, hard, wear-resistant Super Carbide Tipped and Solid Carbide Twist Drills set new standards of economy. Like all Super products, Super Carbide Tipped and Solid Carbide Twist Drills are manufactured under precision-controlled processing conditions which assure finest drill quality and performance. Their superior wearing qualities insure faster work — less down time — faster production.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich.

4105 San Fernando Rd., Glendale 4, Cal.



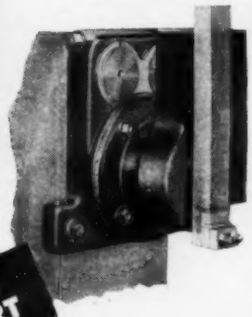
MILLING TIME

CUT 75%

4615 Alloy Steel Forging Milled in 3.8 Minutes on New Kearney & Trecker 50 CSM Milling Machine.

Former Time 15.7 Minutes

Here are the facts of this job taken from the operation and performance sheets. The machining time per piece with the old method was 15.7 minutes. Compare this with the performance shown below:



OPERATION: Face mill four sides
WORKPIECE: Slotting attachment ram
MATERIAL: S. A. E. 4615 forging. 2¼" x 2¾" x 18½"
MACHINE: 50 CSM Vertical
CUTTER: 6" dia., 8 Tooth CSM Carbide Face Mill with 7° negative primary rake angle — .020" wide
CUTTER SPEED: 275 rpm
TABLE FEED: 25 ipm
DEPTH OF CUT: ¼"
MACHINING TIME: 3.8 minutes ✓

Total saving in actual machining time: 11.9 minutes or 75.8% ✓

The part machined in this job is the operating ram used in a slotting attachment for Kearney & Trecker Milling Machines.

CSM Milling Machines were designed to obtain the greatest benefits from modern cutting tools, and are now part of our line of standard models. The design has been developed after complete analyses of industry's problems of milling with carbide cutters.

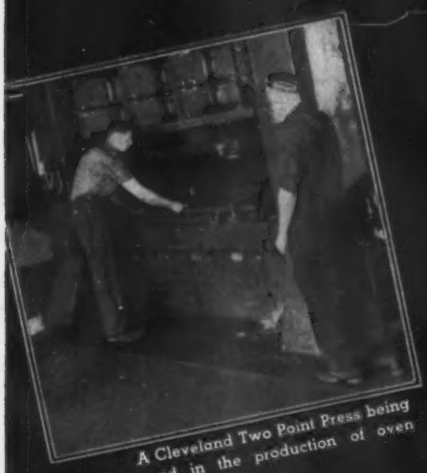
CSM machines are available in 20, 30 or 50 hp models in both plain and vertical knee types.

Write for complete data on CSM machines—CATALOG CSM-20. Please indicate your business connection.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

BE READY FOR TOMORROW . . . WITH CSM's

Modern CLEVELAND Four Point PRESS



A Cleveland Two Point Press being used in the production of oven liners.

This Modern Cleveland Four Point Press, which is symmetrical front and back, exerts a pressure of 500 tons.

The gearing, which is located in the box type crown, runs in a bath of oil and provision has been made for the easy removal of the drive unit . . and the gearing whenever necessary.

The slide is counter balanced by air and the Press is equipped with an electrically controlled, hydraulically operated friction clutch and brake.

The Press has a stroke of 24", adjustment 6", bed area 70" x 108" and operates at 14 R. P. M.

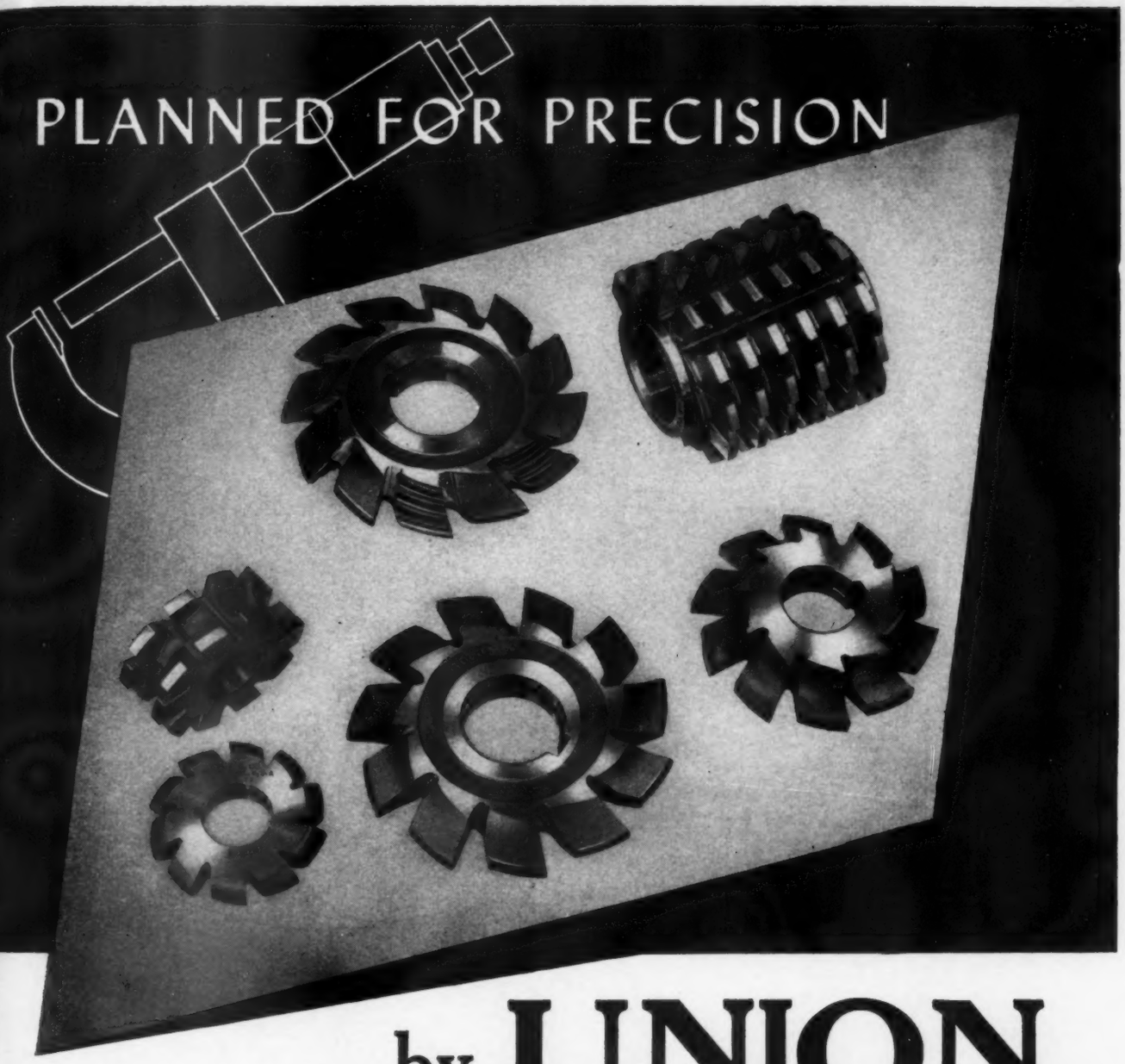
Other Presses of this series include Single Point and Two Point

A Cleveland Four Point Press being used for the production of Automobile bumpers.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

PLANNED FOR PRECISION



...by UNION

Any job which requires high precision also requires careful preliminary planning. Union has helped with an important part of your planning . . . by designing tools which will produce the precision results you want—under production pressure.

UNION TWIST DRILL CO., ATHOL, MASS.

STORES:

New York: 61 Reade St.
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Detroit: 5527 Woodward Ave.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

S. W. Card Mfg. Co. Div.—Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec

for profitable peacetime production choose Butterfields!
BUTTERFIELD DIVISION
Derby Line, Vt.
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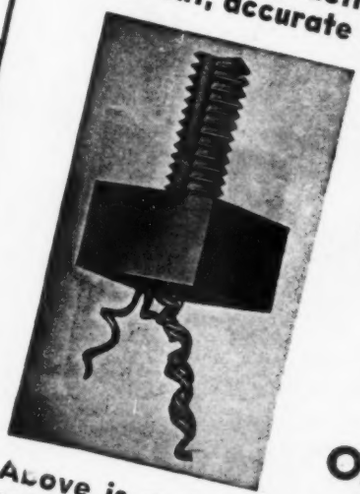
CARD

free-cutting spiral-pointed

HAND TAPS

Card Spiral Pointed Hand Taps are designed for tapping through holes or blind holes when drilled deeply enough. Correctly used, these Taps produce a smooth, free-cutting action which results in excellent, accurate threads.



FORCING THE CHIPS *ahead* OF THE TOP

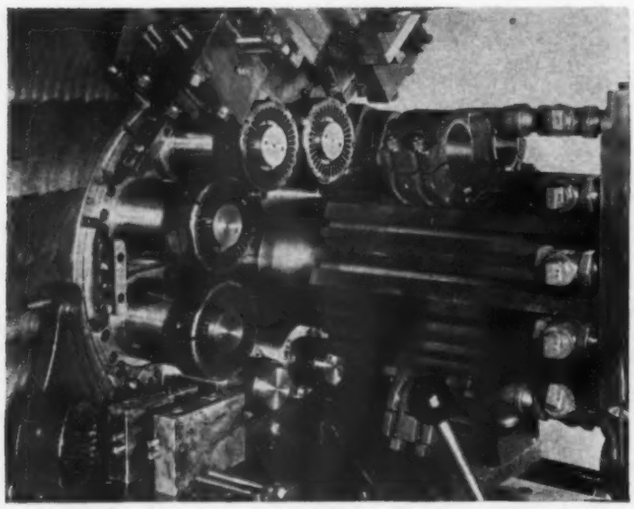
Above is a detailed view of chip-action produced by Card Spiral Pointed Hand Taps. Long, curling chips are forced ahead of the Tap, avoiding clogging, increasing strength of Tap, reducing breakage.

S. W. CARD MFG. CO.
Mansfield Mass.

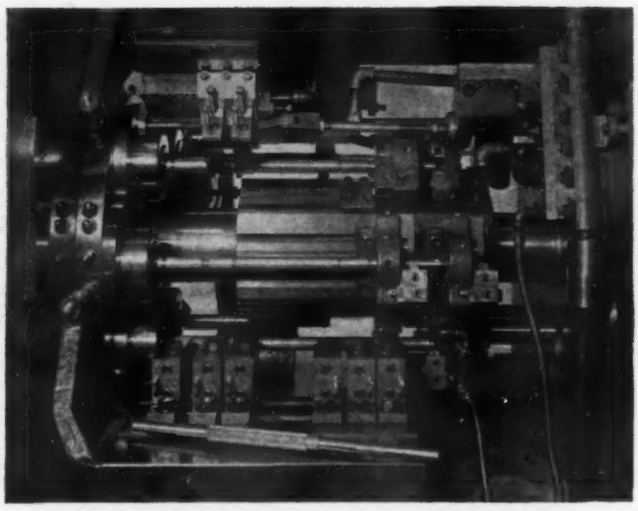
STORES:
New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 5427 Woodward Ave.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 588 First Ave., South

How Co-ordinated Machining Methods

keep costs down!



STATOR — Turn and chamfer — 2 pieces per cycle. Six operations on each piece. Machine: 6″ RPA 8 spindle automatic chucker. Time, 20 seconds.



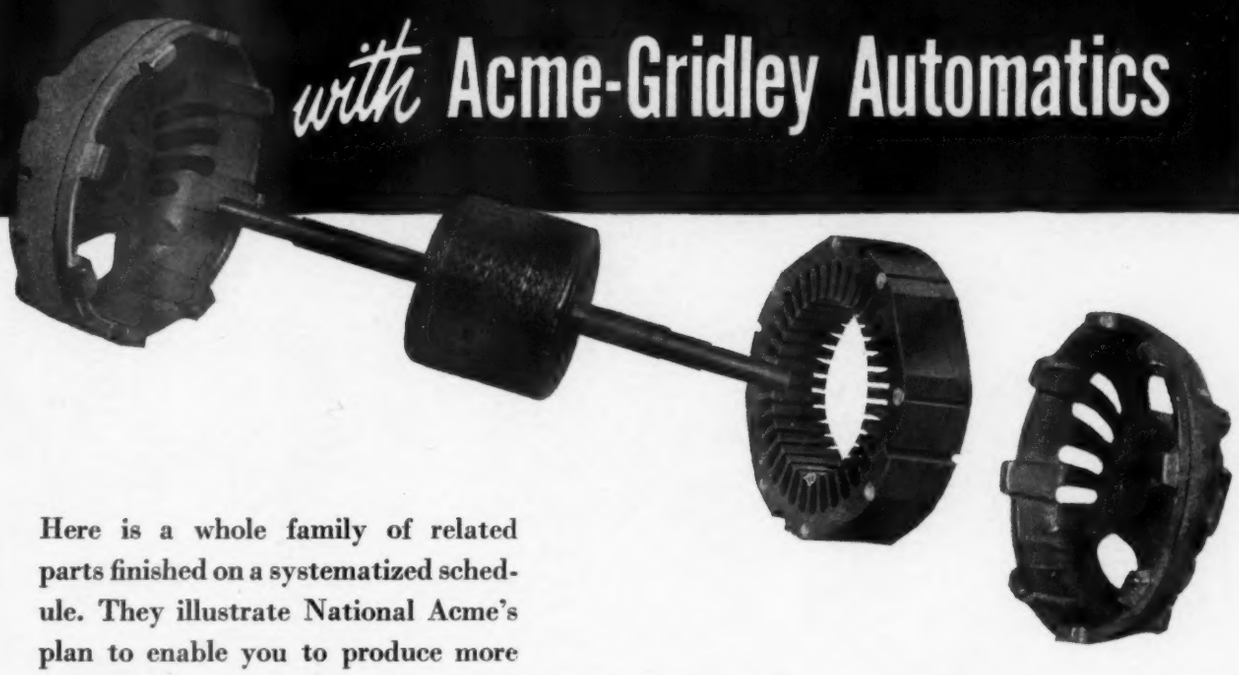
SHAFT—1″ x 18″—Eight operations. Machine: 1⅝″ RB 6 spindle automatic bar machine. Time, 40 seconds.

ROTOR MOUNTED ON SHAFT—Rough and finish turn 2 pieces per cycle. Machine: 5¼″ RAC 6 spindle chucking automatic, equipped with air chucks—2 loading positions. Time, 12½ seconds each.

The NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND 8, OHIO

with Acme-Gridley Automatics

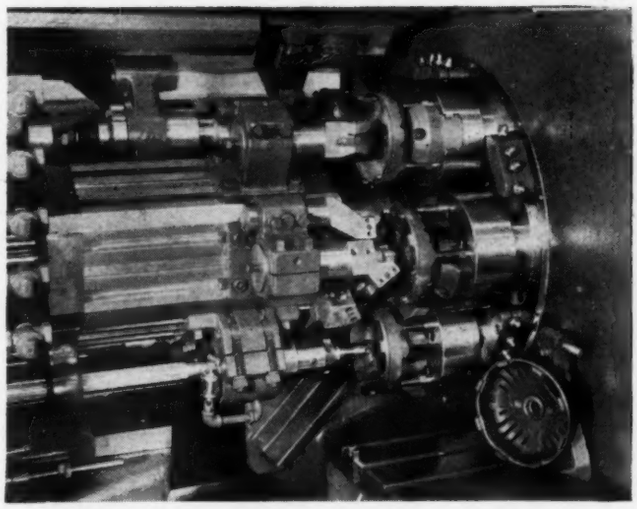


Here is a whole family of related parts finished on a systematized schedule. They illustrate National Acme's plan to enable you to produce more for less.

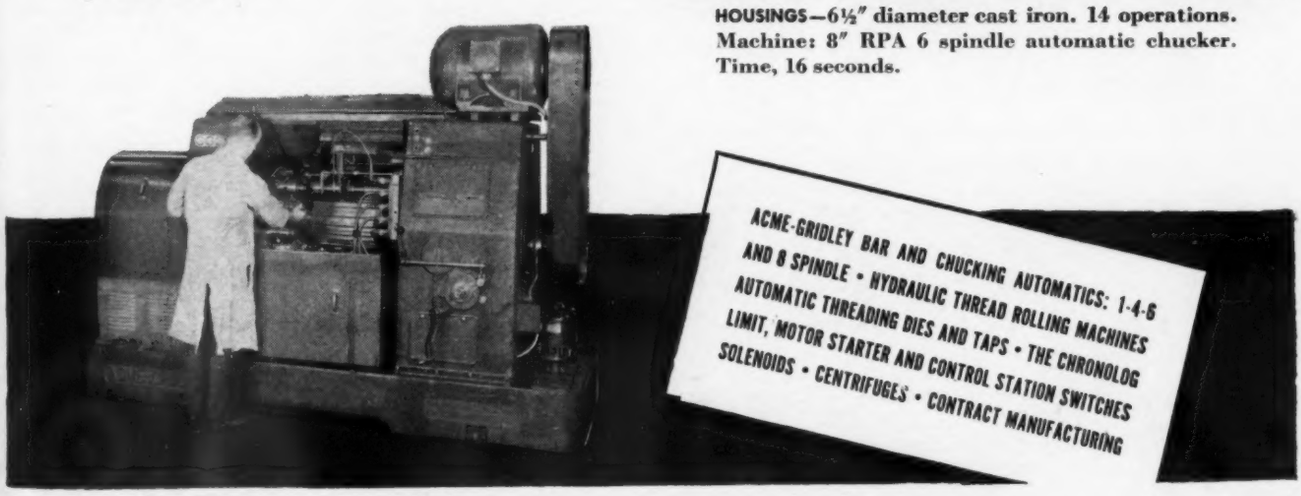
The fractional horsepower motor parts illustrated are typical of National Acme procedure—four parts—four different machine set-ups—a completed job at low cost.

With a broad range of Acme-Gridley automatic bar and chucking machines, we can show similar savings on almost any type of manufacturing. Our recommendations will cover *complete* cycles of operations—or a single job on any part—

May we show you how such co-ordinated methods will step up your production?



HOUSINGS—6½" diameter cast iron. 14 operations. Machine: 8" RPA 6 spindle automatic chucker. Time, 16 seconds.



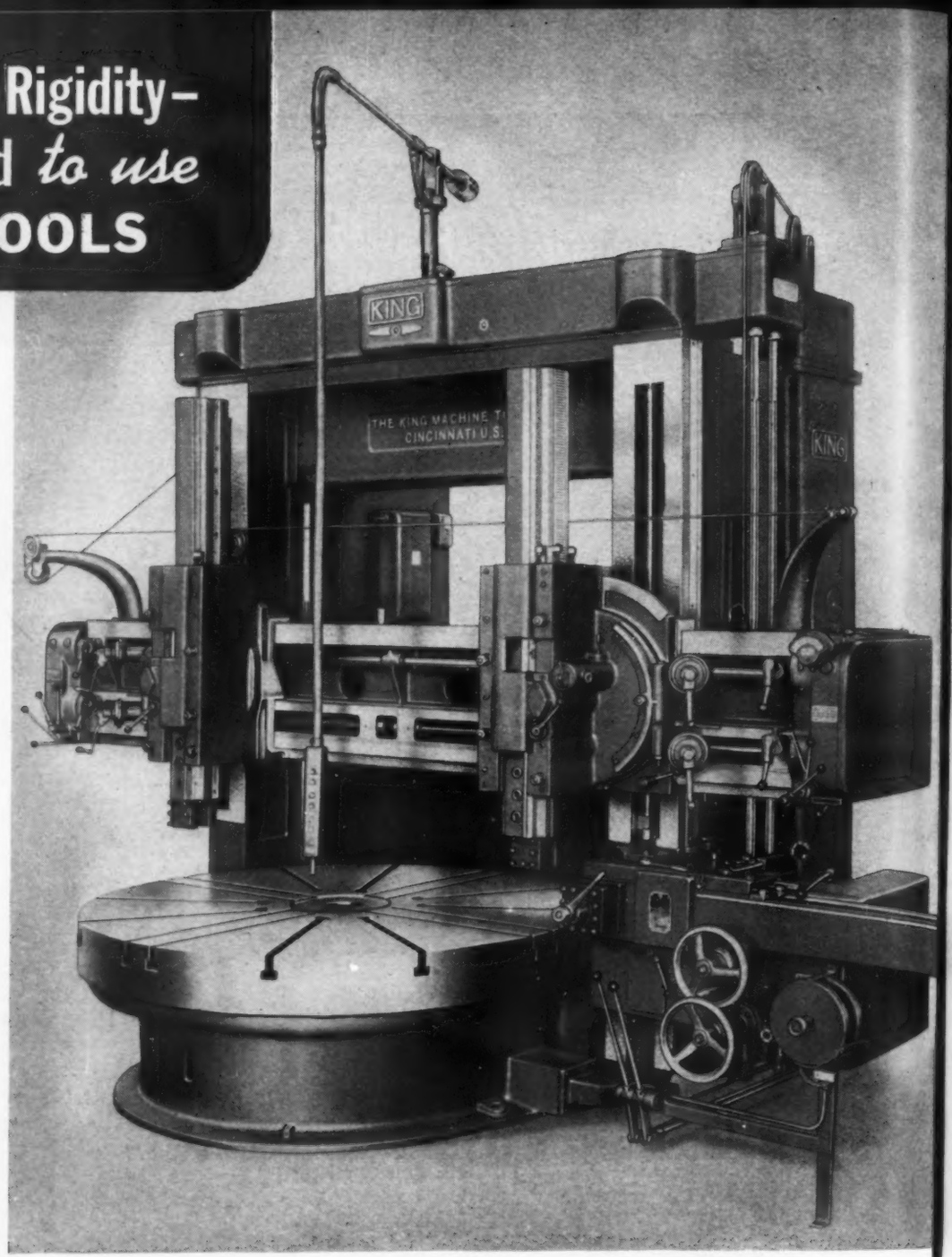
ACME-GRIDLEY BAR AND CHUCKING AUTOMATICS: 1-4-6 AND 8 SPINDLE • HYDRAULIC THREAD ROLLING MACHINES AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Ease of Control–Rigidity–Power and Speed *to use* CARBIDE TOOLS

New Series

KING

Vertical Boring *and* Turning Machine



●The new series King Vertical Boring and Turning Machine includes many features which will help lower your boring, turning and facing costs.

All controls, located to the front of machine within convenient reach—speeds output.

Note the control levers built into the head. These are time savers. Operator makes accurate head adjustments right at his work position. A conveniently located pendant push button station, easily adjusted to height and position, contains the table and rapid traverse control.

New rectangular type rams add the rigidity and accuracy for best results with carbide tools.

For a tool with weight and power to handle the toughest jobs—for a tool with a wide range of feeds and speeds—for all around economy, investigate the new series of King Vertical Boring and Turning Machine.

King Vertical Boring and Turning Machines are available in ten sizes: Single Column Type —30"—36"—42". Double Column Type—52"—62"—72"—84"—100"—120"—144".

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

HERE'S A NEW, ADJUSTABLE

CHUCKING REAMER

that assures

FAST, ACCURATE PRODUCTION

After months of careful research and actual production tests, Lempco is now ready to offer you the best chucking reamer ever made. It is made in two styles. Model C has a straight shank. Model CT has a tapered shank.

The new Lempco Reamer can be used in place of any standard reamer without changing set up. They will produce a smooth finish even when used to finish holes with keyways, slots, oil grooves or other interruptions.

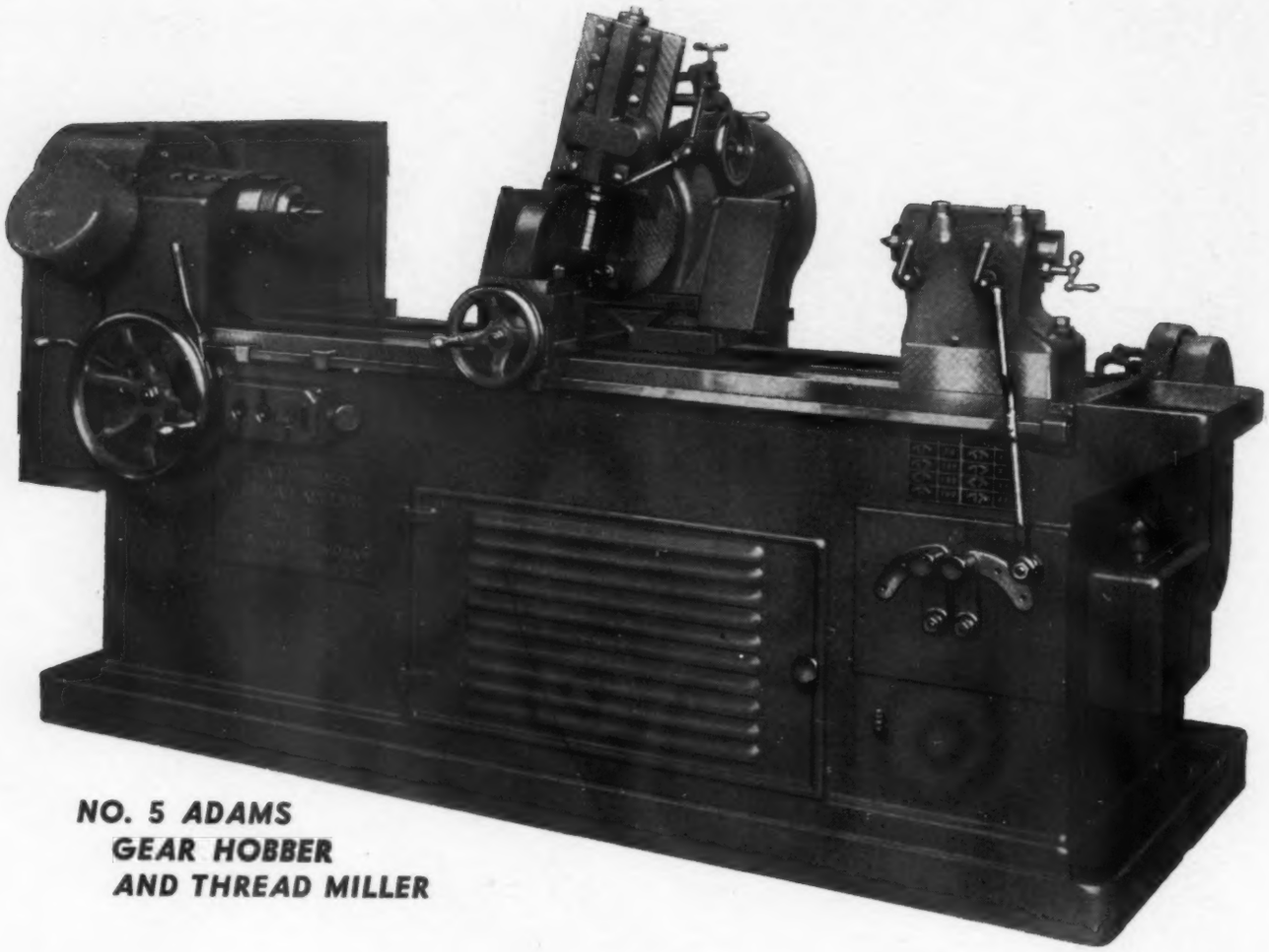
Lempco Chucking Reamers are available in sizes from ¾" to 1 7/32". They have an expansion range of .025" to .031" according to size. These reamers *are not deformed when expanded.* They have straight line expansion, thus assuring a constant cutting surface over the entire length of the blade at all times. Blades can be resharpened 8 to 10 times, then economically replaced.

Decide right now to buy Lempco Adjustable Chucking Reamers. They will enable you to get better and more accurate production.

LEMPCO

5711 DUNHAM ROAD
BEDFORD,
OHIO

WRITE TODAY FOR FULL DETAILS AND PRICES OF THE NEW LEMPCO CHUCKING REAMER



NO. 5 ADAMS
GEAR HOBBER
AND THREAD MILLER

A PRECISION MACHINE WITH EXCEPTIONAL FLEXIBILITY

★ **THE AUTOMOBILE MANUFACTURER—**
will appreciate the accuracy and productive ability of these machines for splining transmission shafts and for hobbing transmission gears, steering worms, etc.

★ **THE MACHINERY BUILDER—**
will find the No. 5 useful in the production of spur and helical gears, splined shafts, worms, lead screws, etc.

DESCRIPTIVE LITERATURE SENT ON REQUEST

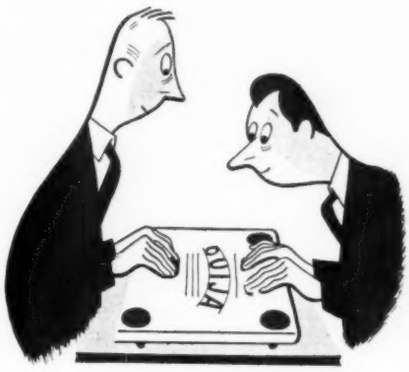
★ **THE GEAR MANUFACTURER—**
can use them to advantage on a large variety of his work and he will find simplicity of setups to be one of the features.

ADAMS

THE ADAMS COMPANY
DUBUQUE, IOWA

ESTABLISHED 1883

YOU COULD TRY ALL THESE BUT...



here's a better way to answer cutting oil questions...

HAVE YOU ever thought of resorting to a soothsayer or Ouija board to get the answers to some of your puzzling cutting oil problems—at times, for example, when it seems that no cutting oil in the plant will give the right finish or reasonable tool life on a new machining or grinding operation? The easiest way, next to reading tea leaves—but a sure way to get the *right* answer—is to use Standard's Cutting Oil Service.

If your plant is located in the Midwest, there is an experienced cutting oil specialist at the nearest Standard Oil office. He's easy to reach and ready to study your cutting oil needs. He'll analyze just one job, or the operation of your whole plant, whichever you wish. There are two sound reasons why he can help you. First, he has complete knowledge of products developed by Standard Oil for practically all machining operations. Second, he has experience in applying these products in many other plants. You'll find Standard's Cutting Oil Service the real short cut to your cutting oil answers. Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

Standard's
CUTTING OIL
SERVICE

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

.LUBRICATION ENGINEERING...STANDARD OIL COMPANY (INDIANA)...LUBRICATION ENGINEERING...STANDA

Fewer oil changes... less deposit with improved

STANOIL

FOR 18 YEARS Standard has provided an oil containing additives to reduce oil oxidation and formation of acidity and deposits in turbines.

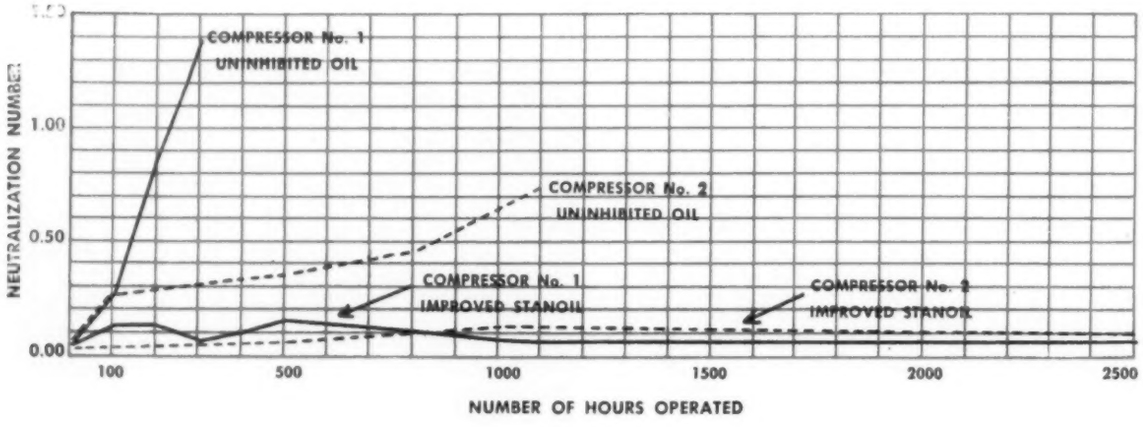
Now Standard has developed and incorporated in Stanoil an additive which improves oxidation resistance for a wide range of industrial applications. Improved Stanoil has been tested under the most severe operating conditions on many types of service: compressors, reduction gears, circulating and hydraulic systems.

Records of one of these severe tests in two compressors are charted below. They show the greatly reduced rate of acidity formation in Improved Stanoil as compared with oils previously used.

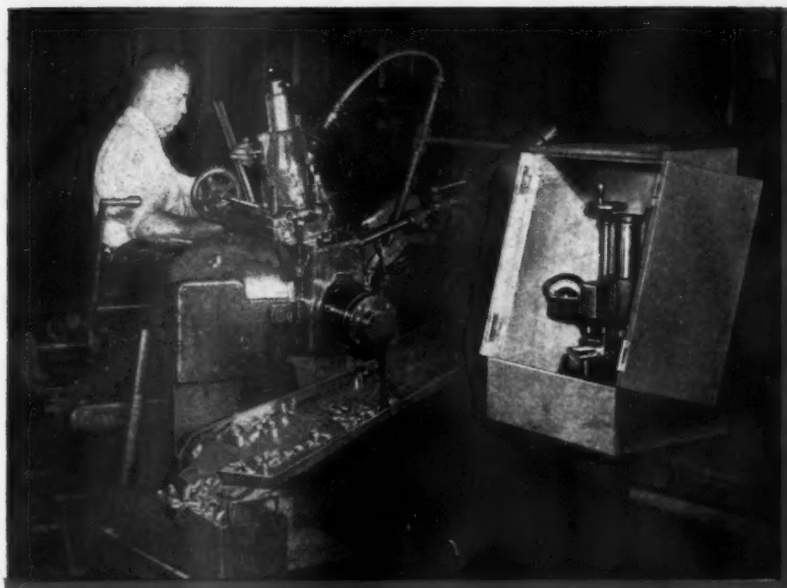
Try Improved Stanoil. Compare oil replacement records with the oil you now use in gear cases, circulating and hydraulic systems. Note how Stanoil reduces deposits in compressors.

A Standard Oil Lubrication Engineer will help you make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

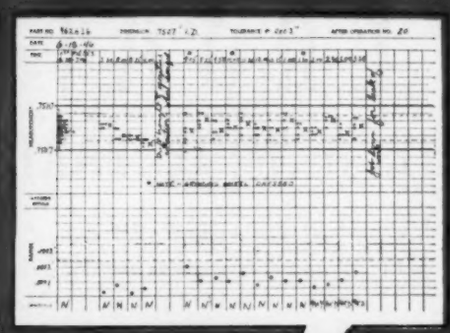
Adverse operating conditions and 24-hour a day operation imposed severe demands on the lubricating oil in two mine compressors. Conventional oil rapidly increased in acidity, as shown by the chart. Improved Stanoil maintained a safe low acidity throughout the 2500 hour test on Compressor No. 1 and for an additional 700 hours on Compressor No. 2 until it was shut down. Make-up was comparable with both oils.



STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE



P&W Electrolimit External Comparator



Control Chart

P&W Electrolimit
Internal Comparator

For Best Results from

STATISTICAL QUALITY CONTROL

Interchangeability of parts is fundamental to today's production. One of the modern ways to maintain interchangeability is by statistical quality control methods that visualize the working control limits within which variations are allowed to deviate from the standard.

Effective statistical quality control requires gages possessing characteristics of *high-sensitivity, readability, accuracy, stability* and *gaging speed.* P&W Electrolimit Comparators — both external and internal — meet these requirements.

P&W Comparators are extremely sensitive instruments, yet heavily constructed to withstand constant shop use.

They are a proved investment in production plants because they help to *reduce manufacturing costs, improve quality* and *increase production.*

Write on your company letterhead for further information and the assistance of our engineers in establishing or improving statistical quality control in your plant.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

VERSATILE...

FOR A WIDE VARIETY OF PRECISION OPERATIONS

South Bend Precision Lathes offer special advantages to production shops, laboratories, and toolrooms that handle diversified work requiring a wide variety of exacting operations. They simplify change-over from one operation to another; help get new jobs into production quickly and economically. With their wide range of spindle speeds, they machine light metals, plastics, and steel with equal ease. A complete line of attachments and accessories enables South Bend Lathes to handle many operations which otherwise might require special fixtures or machinery. Take advantage of this versatility, coupled with South Bend precision, speed, ease of operation, and dependability, to increase the capacity and efficiency of your shop. South Bend Precision Lathes are made with 9", 10", 13", 14½", and 16" swings, collet capacities to 1", and bed lengths to 12'. Write for complete catalog.

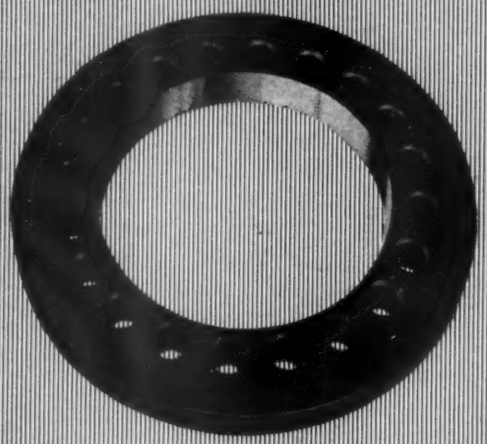
Write For FREE Catalog!

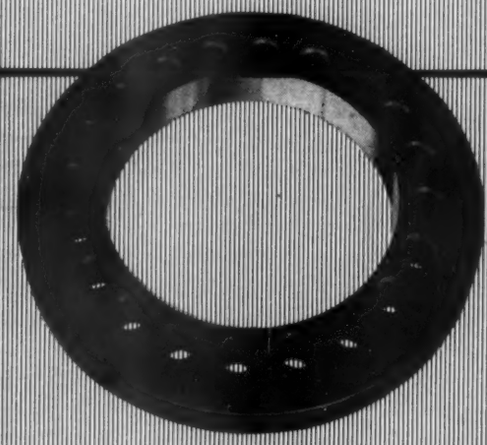
Catalog 100-D illustrates and describes all South Bend Precision Engine Lathes, Toolroom Lathes, and Turret Lathes, gives specifications, shows accessories and attachments. Size 11" x 8½", 68 pages, full color.

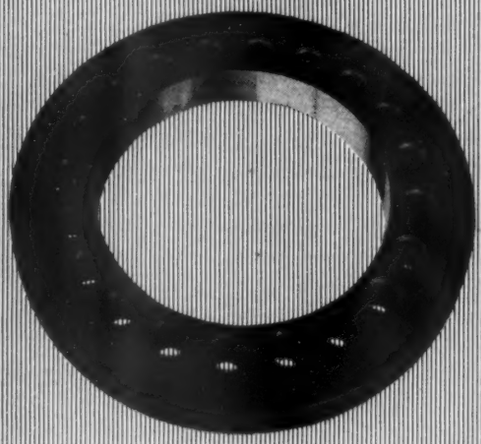
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906







Round
Parallel
Straight
Accuracy
Fine Finish
High Production

=Bryant Method

The Bryant Method offers an answer to any internal grinding problem you may have. With a complete line of grinders, plus an enviable background in engineering, Bryant has a combination that can produce parts with true straightness, parallelism and roundness—with a surface finish to millionths of an inch. And, at a production rate that is worth boasting about.

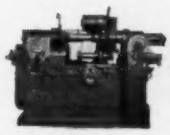
A good example of a Bryant solution for a tough internal grinding problem is shown at the left. The parts are *hardened* steel rings. They meet all required tolerances for roundness, straightness, parallelism and surface finish. The Bryant method allows rough and finish grinding with the same wheel, thereby eliminating further operations formerly necessary to obtain true accuracy and fine finish.

We know your problem is different . . .

but as long as it involves internal grinding and has as its objective high production of parts to very close tolerances, you should consult a man who makes a specialty of solving such problems . . .

Send for the Man from Bryant!

Series 112



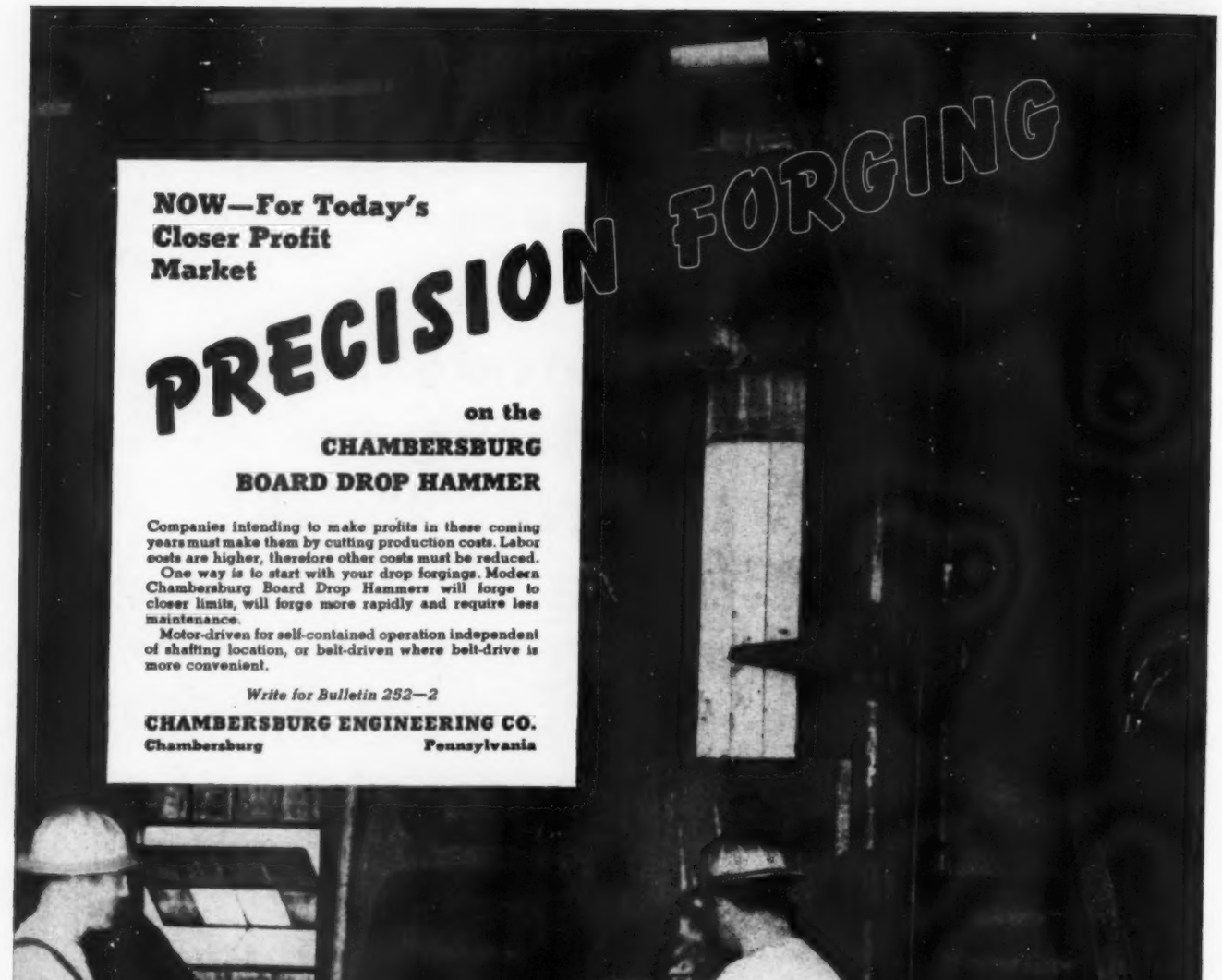
Series 16

Series 24

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT



NOW—For Today's Closer Profit Market

PRECISION FORGING

on the

CHAMBERSBURG

BOARD DROP HAMMER

Companies intending to make profits in these coming years must make them by cutting production costs. Labor costs are higher, therefore other costs must be reduced.

One way is to start with your drop forgings. Modern Chambersburg Board Drop Hammers will forge to closer limits, will forge more rapidly and require less maintenance.

Motor-driven for self-contained operation independent of shafting location, or belt-driven where belt-drive is more convenient.

Write for Bulletin 252—2

CHAMBERSBURG ENGINEERING CO.

Chambersburg **Pennsylvania**

CHAMBERSBURG

Builders of **IMPACT** *Machinery*

Anti-friction bearings last longer when protected with these Gulf Quality Greases:

GULF ANTI-FRICTION GREASE
For moderate and heavy duty service

GULF PRECISION GREASE
For lighter duty and higher speeds

Ball and roller bearings are made with the greatest precision, but they require the best lubricants to insure top performance and long trouble-free service. Hundreds of plants have found that Gulf Anti-Friction Grease and Gulf Precision Grease provide an extra margin of protection for these vital parts.

BOTH laboratory tests and maintenance records in hundreds of plants prove that Gulf Anti-Friction Grease and Gulf Precision Grease are superior lubricants for anti-friction bearings. They have greater stability, a high melting point, maximum resistance to separation, and show minimum change in consistency in service.

Gulf-developed methods of compounding, employing special high-pressure kettles and mixing methods, produce these greases with a relatively smooth, nonfibrous texture.

Both of these superior anti-friction bearing lubricants are available in a broad range of N.L.G.I. consistencies. Call in a Gulf Lubrication Service Engineer today and ask him to recommend the proper type and grade for your every requirement. Or send the coupon below for further information.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company AM
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, complete information on Gulf Anti-Friction Grease and Gulf Precision Grease.

Name.....

Company.....

Title.....

Address.....

COLLETS

Guaranteed *

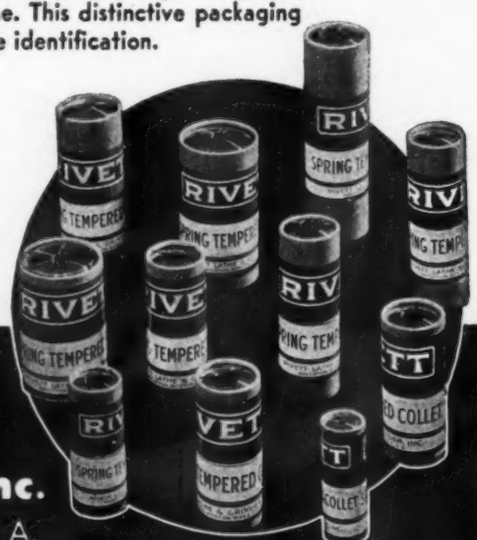
TO RUN DEAD TRUE

Work held in a Rivett Collet is guaranteed to run "dead true" at the Collet mouth and within .002" two inches from the Collet mouth. Rivett Draw-In Collets are available in all standard styles for bench lathe, engine lathe, miller and grinder use.

They have personality derived from a worthy inheritance and a steadily improved environment. When shipped, each Rivett Collet reflects more than fifty years of Collet manufacturing "know-how" and the most advanced machining and inspection.

See how the individual cartons permit you to read easily through the "window" the style, size and Rivett name. This distinctive packaging provides protective storage with absolute identification.

* For complete information on all Rivett Collets and their adaptation to existing machines write for Bulletin 100C.



RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS · U S A

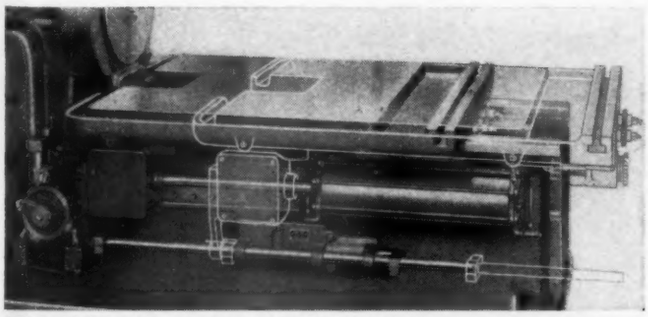
BULLETIN NO. 100C

CHATTER-FREE!

. . . FOR HEAVY, FAST PRODUCTION

SIMPLIMATIC TOOLING

is supported by solid metal from the floor up!



THE SIMPLIMATIC PLATEN TABLE rests on and against hardened and ground steel ways and gibs. It has a fast, smooth traverse to and from cutting position, actuated by pneumatic cylinders.

VERTICAL HEAD TOOLING can be arranged instead of on horizontal platen table when desired. Here, too, you have maximum rigidity and solid support for tools right to the cutting edge.

The heavy platen table of the Simplimatic automatically locks after it traverses to cutting position. Thus it and all the tooling on it become virtually one piece with the bed.

Because of the freedom in positioning slides on the big platen table, tools can be held close to their cutting edges and favored in any way desired. Moreover, this freedom from chatter is permanent because slide top is mounted on hardened steel ways and gibs.

Combined with the solidity of the cutting tools is the precision-fitted spindle of large diameter, on widely spaced roller bearings and its large herringbone drive gear mounted close to the nose. There's no chance anywhere for vibration. Chatter is *designed out!*

That's why Simplimatics can hold to extremely close tolerances, on large parts and at high production speeds. Ask for complete information about the Simplimatics.

Look Ahead . . . Keep Ahead . . . with Gisholt

GISHOLT

GISHOLT MACHINE COMPANY
1201 E. Washington Avenue, Madison 3, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

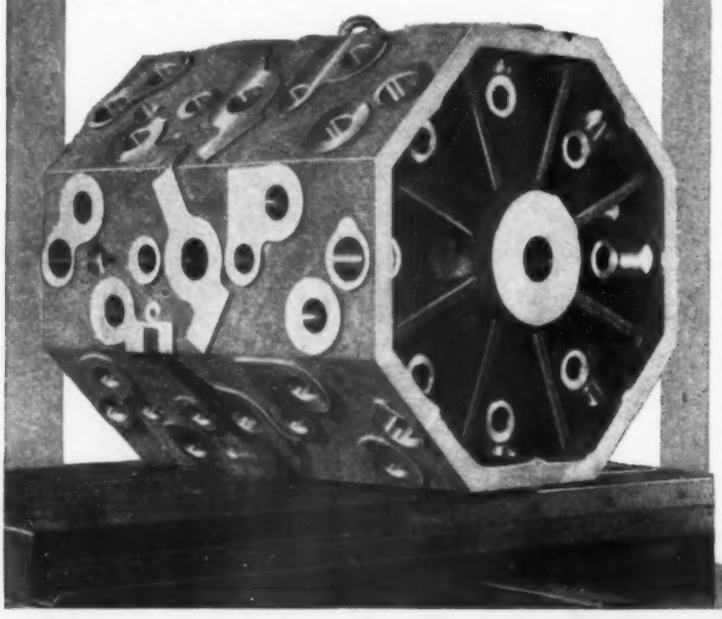
They're Building a Business around JIGMIL Performance!

JACK CUNNINGHAM and MATT JACKSON
Founders of Zip Tool and Engineering Company

The World's Finest Jig Boring and Milling Machine!

140 Holes—8 Faces, 2 Ends—Milled and Bored Complete to Overall Accuracy within .0005"! Floor-to-Floor Time: 75 Hours!

Typical JIGMIL work being done by Zip Tool and Engineering Company of Detroit is the large trunnion shown below. Made for a special precision index milling and drilling machine, its eight faces and two ends have a combined total of 140 holes! The entire job, milled and bored complete to overall accuracies within .0005", was done on the JIGMIL by means of push button controls! Total floor-to-floor time: 75 hours!



Recipe for a Business!

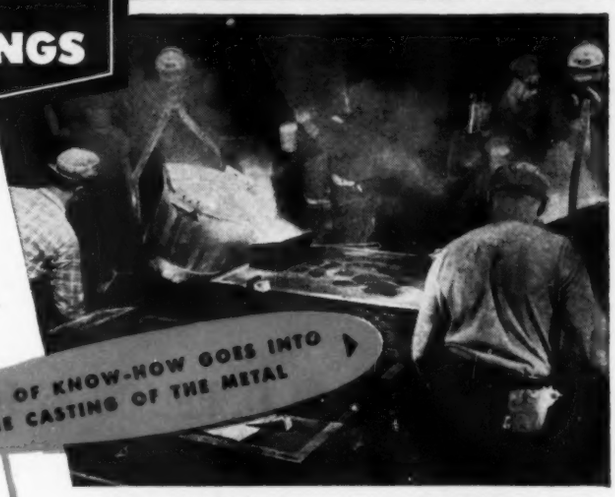
Take two skilled, enterprising mechanics, add one DeVlieg JIGMIL, and you have the essential ingredients required to start a good tool and machine business. That's the formula followed by Jack Cunningham and Matt Jackson in launching their own Zip Tool and Engineering Company in Detroit.

Both were tool-makers with JIGMIL experience; both saw the possibilities of building a business around JIGMIL performance. Pooling their assets, they managed the JIGMIL down payment, arranged for financing, then went to work. Now they're on the way toward needing a second JIGMIL in preparation for broadening their activities into a full functioning tool and machine business.

Technical literature describing 3-B DeVlieg JIGMIL design, construction and operation is available upon request. Write for your copy today!

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

A LOT MORE THAN *Metal* GOES INTO AMERICAN MAGNESIUM SAND CASTINGS



You first feel the impact of American Magnesium's drive for quality as our engineers assist in designing a part to take full advantage of magnesium's weight-saving ability. They may suggest changes here or there to assure more uniform, sounder castings.

Follow the part through American Magnesium's plant and you're certain to be impressed by the know-how evidenced in every department. You're seeing nearly a quarter of a century's experience going into that production.

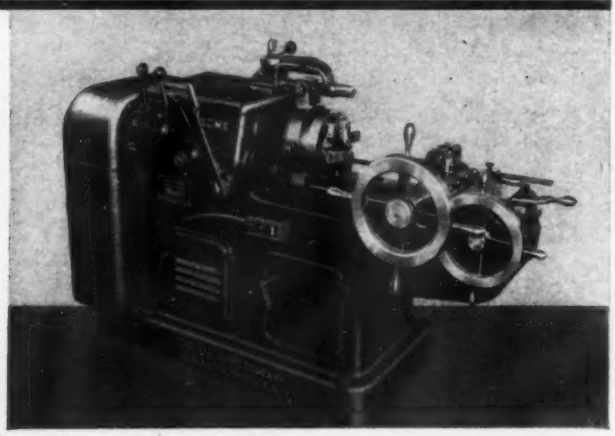
Designers, builders and users are invited to investigate what American Magnesium's high quality castings will do for their products. Ask the nearby Alcoa office. Or write Aluminum Company of America, Sales Agents for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

REG. U.S. PAT. OFF.

AMERICAN MAGNESIUM CORPORATION
SUBSIDIARY OF
ALUMINUM COMPANY OF AMERICA

10 USES *for an* ACME XL



1. STRAIGHT THREADING
2. TAPER THREADING
3. COARSE THREADING (multiple cuts)
4. SHOULDER THREADING (with minimum clearance)
5. PIPE AND NIPPLE THREADING
6. HOLLOW MILLING (continuous and undercut)
7. BOLT POINTING
8. BOLT FACING
9. TAPPING
10. REPETITIVE ACCURACY

HILL ACME TOOLS FOR INDUSTRY

The micrometer adjustment of the die head (exclusive on ACME XL Threading Machines) insures exact duplication on every piece entailing a threading operation. ACME XL machines are built in sizes from 1" to 3" inclusive.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

FORGING · THREADING · TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" HYDRAULIC SURFACE GRINDERS "CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

PUT THE HEAT ON THOUSANDS OF JOBS...

With Fast, Precise

ELECTRONIC HEATING

ELECTRONIC HEATERS

ANNEALING

100,000 THUMBSCREWS PER DAY

BRAZING

2,000 ELBOWS PER HOUR

HARDENING

ONE GEAR EVERY 4 SECONDS

SOLDERING

900 CAPACITORS PER HOUR

Typical Applications

To meet individual production requirements, such as these, covering a wide range of heat-treating operations, G-E Electronic Induction Heaters are used with G-E-designed and -built, manual and automatic parts-handling equipment.

● Literally thousands of localized heat applications to practically any metal—steel, copper, brass, nickel—are possible with G-E Electronic Induction Heaters. Case histories have repeatedly shown that you can harden, anneal, braze or solder at lower cost—and in a fraction of the time required by other methods.

G-E Electronic Heaters consistently assure uniform, high-quality output in heat-treating operations. The applied heat is localized to the *exact* area to be processed, and close control of both the time and intensity of heating is made possible.

Investigate how you may obtain the advantages of fast production, versatility, low cost, and uniform high-quality in your heat-treating operations by consulting the Heating Specialist in a G-E Office near you. His recommendations are based upon experience gained in hundreds of installations, plus almost half a century in the development, manufacture and application of all types of electric heating equipment. Or, write, ***Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

GENERAL ELECTRIC

675-139-8744

PRODUCTION COSTS GO DOWN...

The evolution of profitable mass production developed like this:

As you produce more efficiently, you lower your costs and continually tap new markets of mass buyers. But efficiency can go only so far—and direct labor has been and will continue to be a rising cost. It eats into your sales potential and shrinks your profits.

So your problem becomes that of making the individual workman more efficient—of producing not just more goods, but more goods per man-hour, with less effort and less fatigue per man.

On this principle of more production per man-hour, mass producers in the metal-working industries are meeting the problem. Many of them all over the world have met it by using Cross Special Machine Tools, specially designed to perform one or a series of metal-working operations automatically with semi-skilled operators or attendants.

Lowell Thomas tells the story of the mass production evolution in a new Cross motion picture, "Tools For Profit." The film runs 30 minutes, and prints are available now for group showings. Arrange a booking by writing, on your letterhead, to the Cross Company, Detroit 7, Michigan.

THE CROSS COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING · DRILLING · TAPPING · BORING · TURNING · SHAPING · GRINDING · HONING

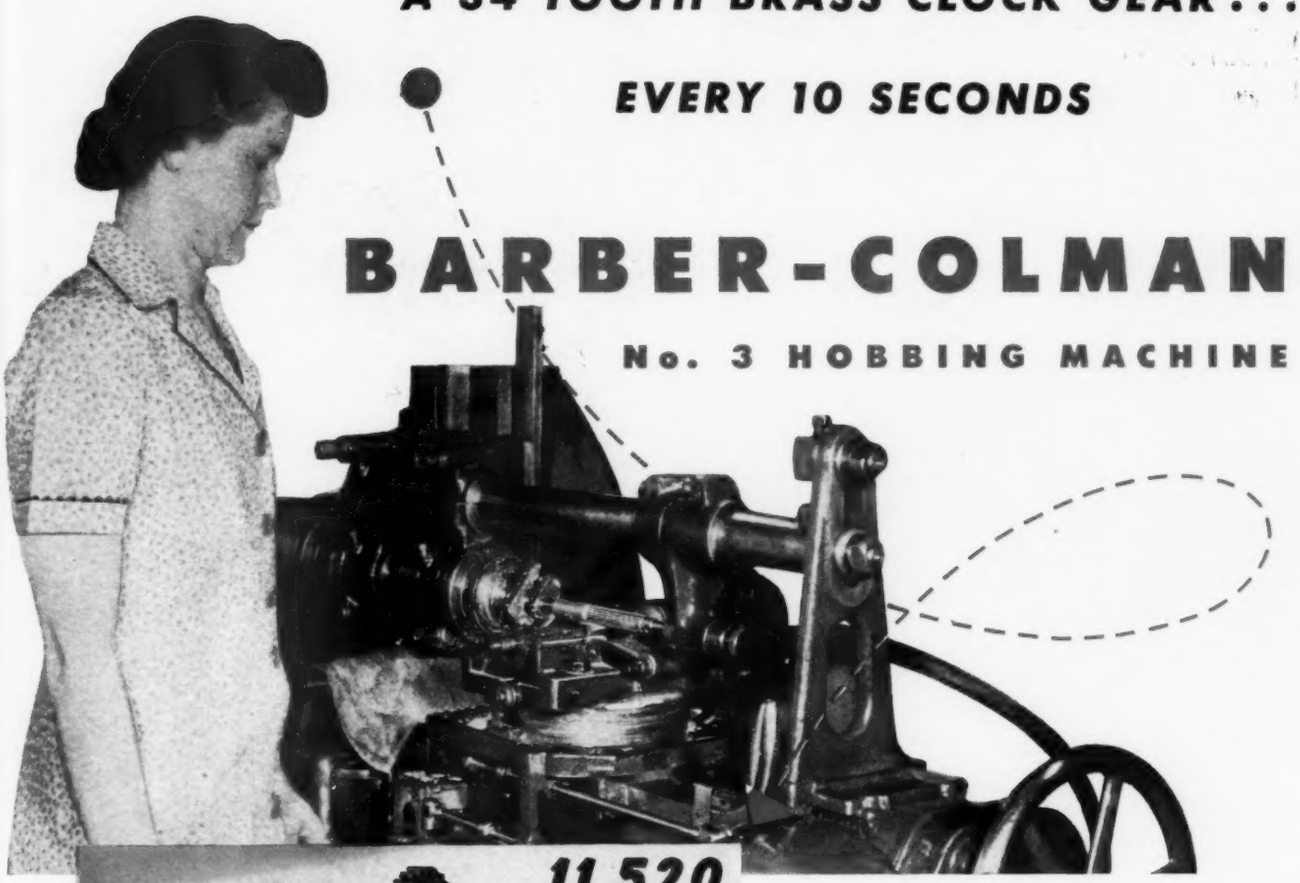
DETROIT 7, MICHIGAN

A 34 TOOTH BRASS CLOCK GEAR . . .

EVERY 10 SECONDS

BARBER-COLMAN

No. 3 HOBBING MACHINE



11,520 GEARS FOR EACH GRIND OF THE HOB

Arbor loads nearly six inches long carrying 90 of these ¾" clock gear blanks are hobbed with efficiency and *high production* on a Standard Barber-Colman No. 3 Hobbing Machine. Each load is checked for runout within .001", and the gears come well within a tolerance of .002", measured over wires. In addition, pieces at random are checked on a comparator against the engineering layout. Rates of production average four loads per hour for a total of 360 gears. The hob is shifted every 16 hours, for 3 settings, and delivers 11,520 pieces per grind.

JOB FACTS

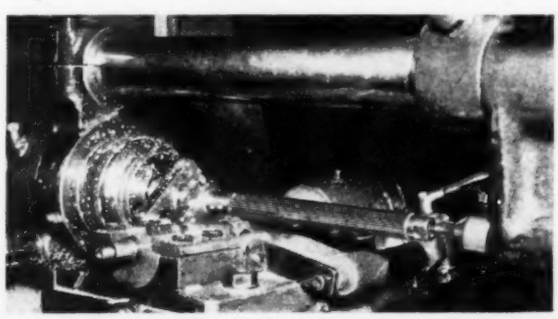
PIECE Stationary gear, brass four numbers hard, 34 teeth, clock form, .0674 circular pitch, .750" O D., 7083" — .002" pitch diameter, .066" face.

SET-UP Feed per rev. of work .025", hob speed 533 r.p.m., arbor checked for runout within .001", length of cut 5.94".

PRODUCTION 360 pieces per hour on each of two machines tended by one operator, hob settings 3 (one every 16 hours), 3840 pieces per setting

This is a typical example of how Barber-Colman engineered tooling provides additional advantages of accuracy and high production on the No. 3 Hobbing Machine. Keep these possibilities in mind when work of this kind comes up. The Barber-Colman Engineering Department will be glad to cooperate with you in working out any special tooling or set-up that may be required. *Use Barber-Colman Engineering Service to help solve your gear-cutting problems.*

Below, a close-up of the arbor load of 90 pieces with the hob just finishing its cut. Gears are ¾" diameter and the load is nearly six inches long. Note the well-made special dog driver.



BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

We certainly don't expect you to join our growing list of customers *unless* we can give you better abrasive products for *your particular production jobs* . . . plus better service.

Our rapid growth in ten years from one of the smallest makers of abrasive products to one of the largest, didn't just happen. Company after company found we could help them get better production, lower costs . . . and give them better service. That's how we built our business.

Should you use MID-WEST abrasives? The only way we know for finding out is for you to give us a trial. It's worth it . . . if you're looking for better production, lower costs, and better service. Call us. We'll cooperate.

James Jackson
PRESIDENT

MID-WEST ABRASIVE COMPANY

OWOSSO, MICH. DETROIT ROCHESTER, PA.

GRINDING WHEELS HONING STONES COATED ABRASIVES

Until 1951, don't even bother to look at the bearings of this skip hoist motor—if it has Westinghouse prelubricated sealed ball bearings.

Another place where No Lubrication until 1951 saves money

In every plant are many motors so placed that they're hard to reach for frequent lubrication—where motors that need no lubrication for 5 years or more would bring important savings in maintenance.

The only motors with prelubricated sealed ball bearings, which need not even be inspected for 5 years or more under normal operating conditions, are Westinghouse motors in Types CSP and CS, frames 203 to 326 inclusive. They have run in actual operation for periods longer than this, bringing savings in maintenance as well as other advantages—

- No overgreasing
- No "skipped" bearings
- No grease contamination
- No grease seepage
- No unreplaced pipe plugs

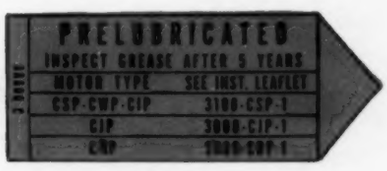
Since frequent lubrication is abolished in these motors, a greater freedom is permitted design engineers and plant layout engineers. They can now place motors advantageously for efficient operation—unhampered by questions of accessibility and ease of greasing. For further details, write for Bulletin B-3554 and Descriptive Bulletins 3100-CSP and 3100-CS-1 to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21392

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Squirrel Cage Motors

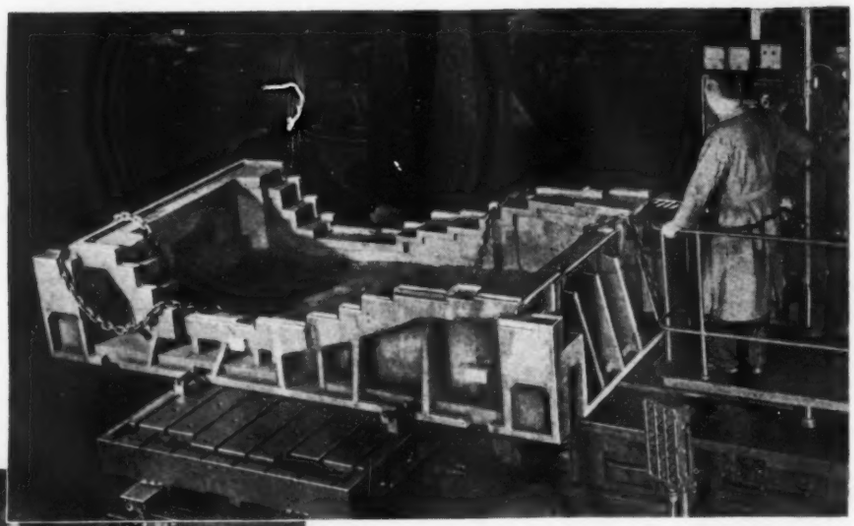
Prelubricated sealed ball bearings are available in Types CSP and CS motors, 203 to 326 frames.



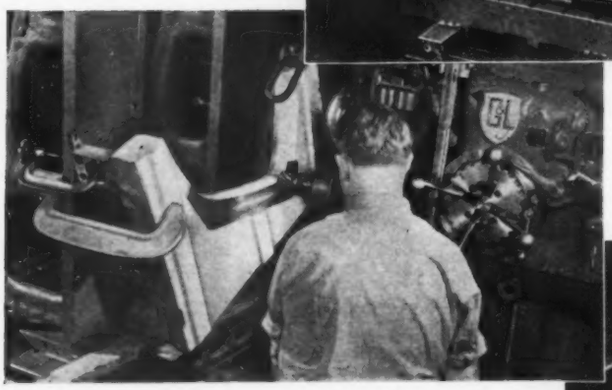
Another Westinghouse "first"—this label identifies motors that you "Don't lubricate for 5 years or more".

G. & L. MACHINE *Saves over* 40 *hours*

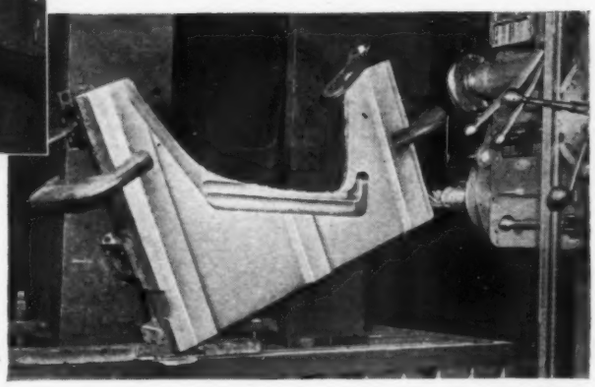
AUTOMOBILE ROOF TRIM DIE



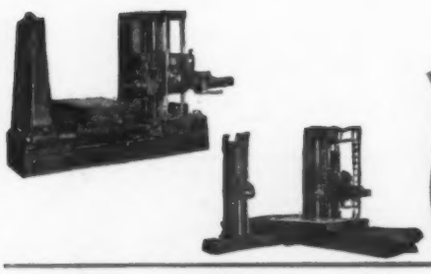
This 9-ton roof top trim die is readily machined on a 570-T Table Type Giddings & Lewis Horizontal Boring Drilling and Milling Machine.

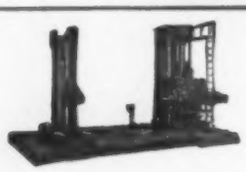


Contour milling of a segmental automotive window die



Simple angle plates hold this window die in position for machining. Set-ups like this mean worthwhile savings in over-all machining.





Giddings

IN MULTIPLE OPERATIONS ON HUGE

• • • Smaller G. & L. Profitably Mills Contours on Window Re-enforcement Forming Dies — And Machines Similar Other Die Segments Faster and Easier.

One of Detroit's largest producers of automotive body dies cuts machining time more than 40 hours on a *9 ton* roof top trim die by using a G. & L. horizontal boring machine. Performing the same operations on another machine required additional layout work, added set-ups and more actual machine time.

Now the steps on both sides of the die, the ends and side pads are milled in a floor-to-floor time of approximately 70 hours. The large table type Giddings & Lewis horizontal boring, drilling and milling machine has ample capacity to handle this huge casting. There are no interfering supports or columns to complicate the work set-up. An overhead crane readily positions the die on the machine table, where it is possible to perform machining operations easier, faster and more accurately.

Increasing Production of Segmental Type Dies

Just as the large G. & L. machine, through its open construction, simplifies work set-up and speeds the machining of unusually big parts, the small versatile, highly flexible Giddings & Lewis horizontal boring machine quickens the output of segmental type dies.

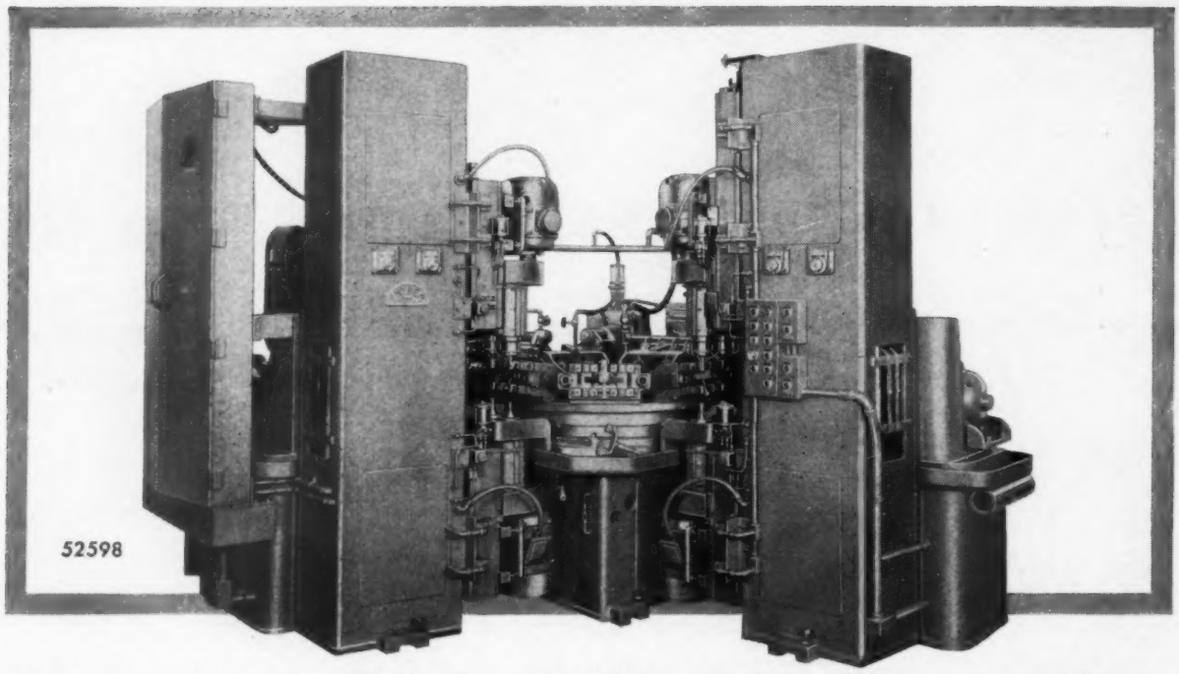
Two photographs show how a window re-enforcement forming die is mounted on angle plates and machined. Irregular shaped die components such as this part are contour milled, bored, drilled and faced without difficulty. On this window die only five simple set-ups were required to mill the insert recess, machine the ends and heel surfaces and bore a single one-inch hole. Versatility and flexibility of the G. & L. machine are obtained through longitudinal saddle movement, lateral table movement, vertical headstock movement and spindle traverse.

Experienced Giddings & Lewis engineers will gladly discuss your die making problems and show you how to make exceptional savings by using G. & L. equipment. Do not hesitate to submit your machining problems for their consideration. There is no obligation for this help.

Profitable
PRODUCTION FACTS— covering interesting field cases show how Giddings & Lewis machines and attachments will increase work output. Write for this *FREE* information now. Ask for Bulletin AM86.

G & Lewis MACHINE TOOL CO.

138 DOTY STREET • FOND DU LAC, WISCONSIN

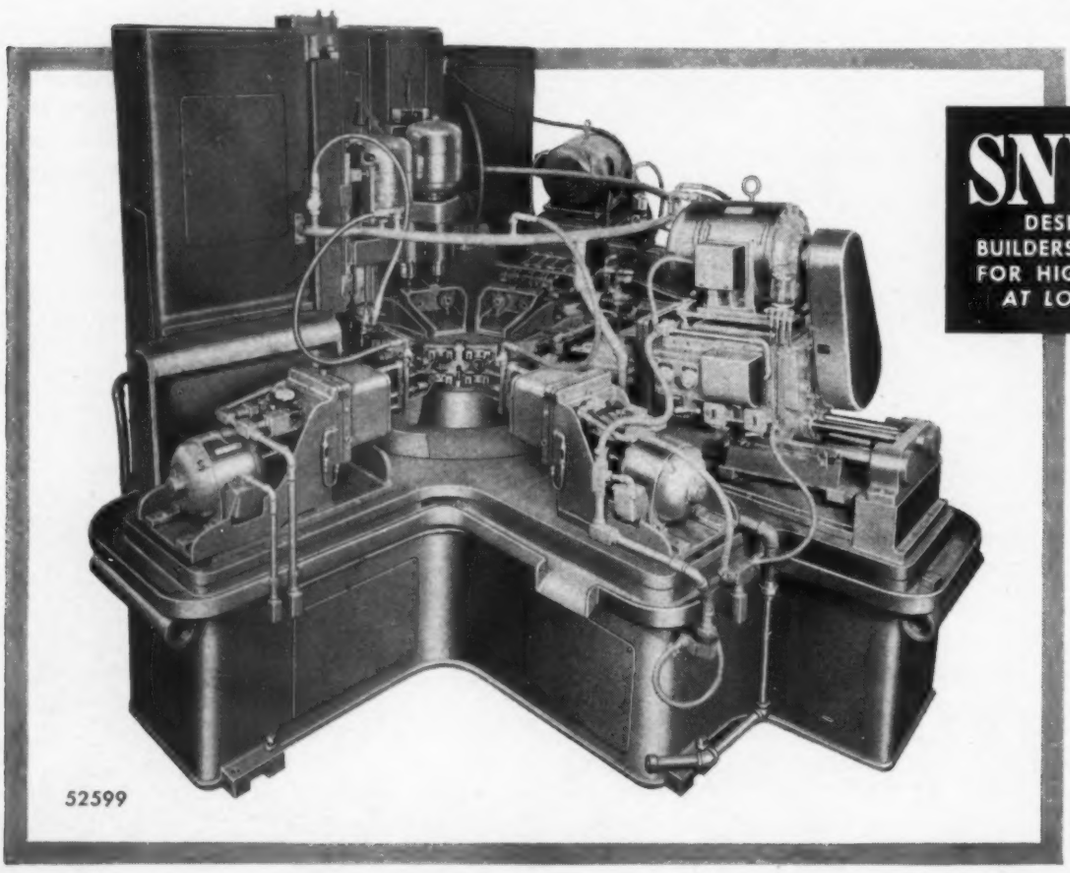


7-STATION *Snyder* SPECIAL for PROCESSING STEERING KNUCKLES

Designed and built by Snyder specifically for processing automotive steering knuckles, this special-purpose machine has an estimated production of more than 100 cycles an hour, or, over 200 parts, at 80% efficiency.

Each fixture on the seven stations clamps two parts—one left and one right. The operations performed are drilling, reaming, tapping and two-way rough and finish boring, these operations being performed by a series of units arranged around an automatically operated index table.

The automatic operation, reduction in handling and in operator fatigue, control of accuracy, finish and time cycle are typical of the advantages in Snyder special-purpose machines. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

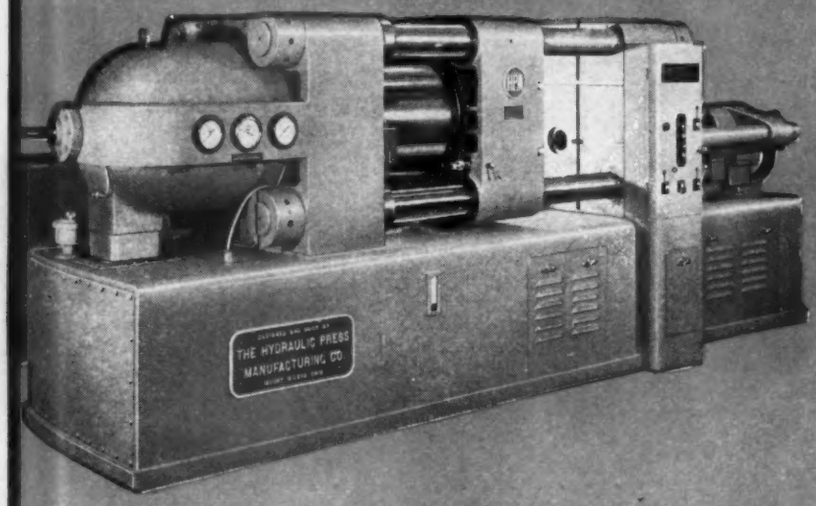


SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

21 Years of Successful Cooperation with Leading American Industries

DIE CASTING LOWERS PRODUCTION COSTS OF INTRICATE METAL PARTS!



The large aluminum vacuum cleaner part illustrated above is a typical die casting produced to accurate dimensions with H-P-M "All-Hydraulic" die casting machines. Actual production results obtained by die casting this part (figures available upon request) prove that die casting is far superior to other production methods.

Investigate the possibility of mass producing your intricate metal parts with H-P-M "All-Hydraulic" die casting machines. Gain the advantages die casting offers... ideal plating surface, greater strength, lower labor costs. H-P-M die casting machines are built in stock quantities, permitting prompt delivery. Write today, stating your requirements.

THE HYDRAULIC PRESS MFG. COMPANY
Mount Gilead, Ohio, U.S.A.
Branch Offices in New York, Philadelphia, Cleveland, Cincinnati, Detroit and Chicago. Representatives in other principal cities.

SPECIFICATIONS

MODEL NUMBERS	400-A	400-M
Mold Clamp (tons)	400	400
Die space (maximum)	23" x 38"	23" x 38"
Injection pressure	6000 to 50,000 psi	
Injection speeds (inches/minute)	1200	7200
Motor horsepower	30	40

Note: Larger sizes built on special order

HPM

All Hydraulic-High Pressure

DIE CASTING MACHINES

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1887

LET'S "TALK TORQUE"

about Faster Driving of Nuts, Bolts and Cap Screws

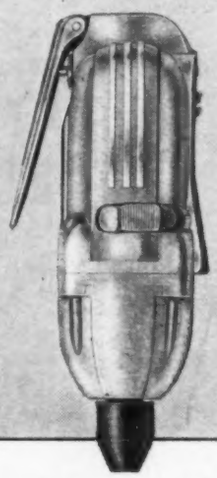
NEW Thor **⅜" PNEUMATIC**

IMPACT WRENCH

READY FOR IMMEDIATE DELIVERY

GREATER TORQUE ACTION—with no torque *reaction* to fatigue the operator—is the big feature of this power-packed, easy-handling Thor *reversible* Impact Wrench. It drives and removes nuts, bolts and cap screws faster because a new and more efficient *direct impact* mechanism and *short spindle* provide maximum striking power. No matter how tightly fasteners are to be driven, or how firmly they may be set, this amazing tool has the power and torque to handle the toughest jobs.

In addition, it's smaller, lighter and more compact—*it weighs only 3¾ pounds*—but it's sturdier and longer wearing. Simplified design reduces wear and insures smoother operation. You'll find it ideal for fast, low-cost production. *Try it*—ask your nearest Thor representative for a demonstration.



Model No. 6
GRIP THROTTLE
Only 5 7/16" long—⅜" capacity.

LEVER THROTTLE
Furnished in place of grip throttle, if specified. No extra charge. Ideal for vertical suspension work.

¼, ⅜, ½ and 1¼" capacities will soon be available.

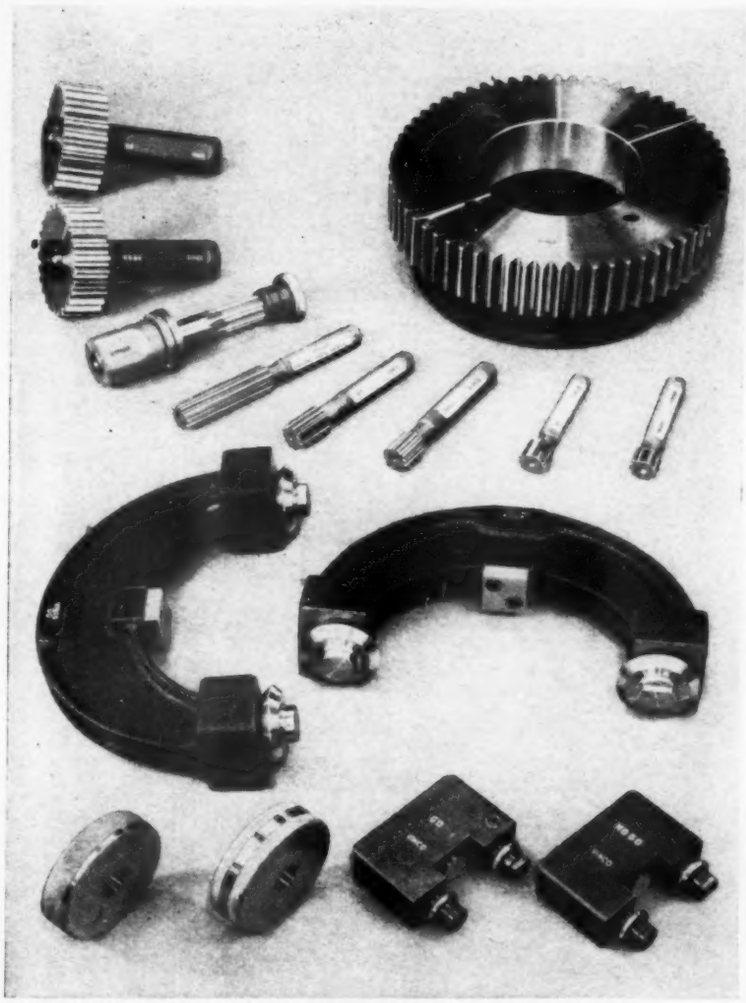
INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

Thor **PORTABLE POWER TOOLS**

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

Tiny BUT *Vital*



Involute Gages

An Involute Spline Gage—dwarfed by a match but accurate to a "Tenth"

Whether it is tiny or takes a couple of husky hands to manipulate, an involute spline gage by VINCO is the ultimate in accuracy and finish.

A broad statement you may say—but it is not our own. It is the consensus of opinion universally expressed by gage users and *competitive gagemakers* throughout the industrial world.

Exclusive techniques and methods, developed through twenty years of intensive application to this gage production problem, have given us this leadership. Use this specialized experience to assure the reliable inspection control of your involute splined production parts.

VINCO

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Plain Cylindrical Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

They Came to

Because it was part of a well formed plan

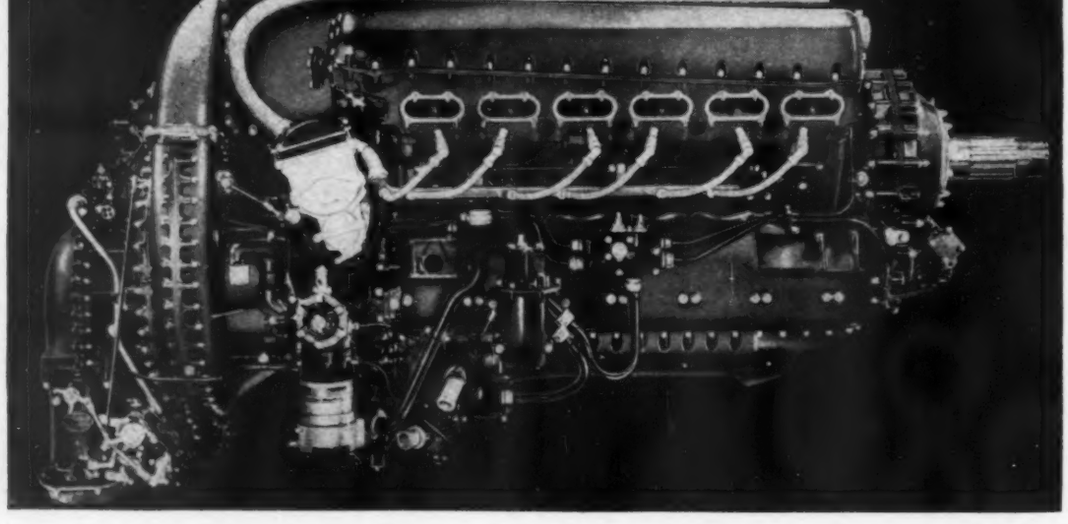
Packard had taken the assignment of producing the famous hand made Rolls Royce Merlin Engine on a mass production basis. Packard engineers, wise in the ways of precision production, knew a comprehensive and reliable inspection control was an absolute necessity. They also knew that VINCO could be relied upon to furnish a large portion of this control.

We do not wish to imply that VINCO Gages were used exclusively. We can say however that VINCO plain plugs and rings, spline gages of every type, special and built-up gages, VINCO Gear Rolling Inspection Fixtures, Master Gears, special purpose and B-1 formed wheel dressers, VINCO Involute Checkers, VINCO Optical Master Inspection Dividing Heads and other inspection services were used to check the size and assembly operation of the more than 14,000 precision parts required in the efficient functioning of this remarkable power plant. The VINCO Semi-Automatic Spline and Gear Grinder, due to its extreme accuracy and efficiency, contributed much to increasing the production of close tolerance splined parts and gears.

The part VINCO played in this dramatic chapter of industrial history is an accomplishment of which we are naturally proud, but no one prospers on past performance alone. VINCO engineering knowledge and mechanical skill borrow from the past only when that experience can be applied to perfecting the job at hand. Proper and adequate inspection control is an absolute "must" if efficient precision production is to be maintained. The selection of all necessary gaging equipment requires serious thought and consideration. For your guidance use VINCO as a standard of comparison when these selections are being made.

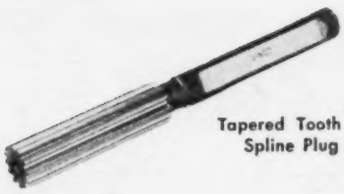
VINCO CORP., 8855 SCHAEFER HWY., DETROIT 27, MICHIGAN

Rolls Royce Merlin Engine as Produced by Packard

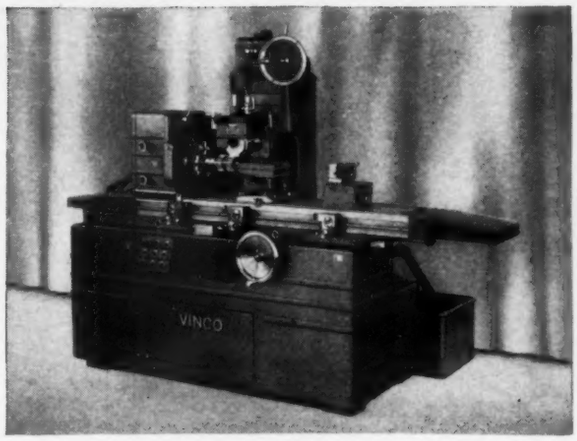


Prong Type Straight Sided Spline Ring Gage

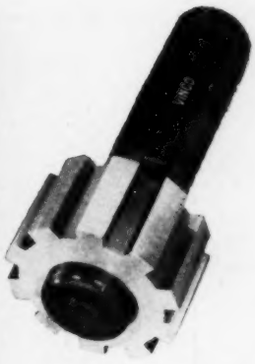
VINCO



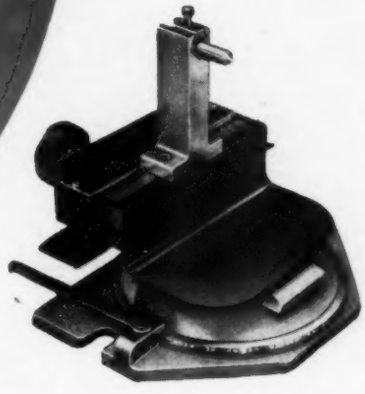
Tapered Tooth Involute
Spline Plug Gage



Semi-Automatic Spline and Gear Grinder



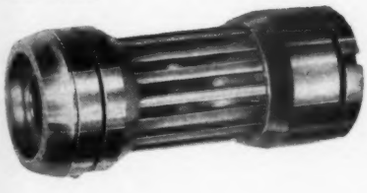
Straight Sided
Spline Plug Gage

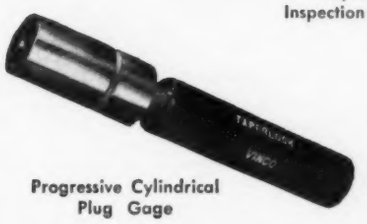


B-1 Dresser

Optical Master
Inspection Dividing Head

Propeller
Hub Arbor





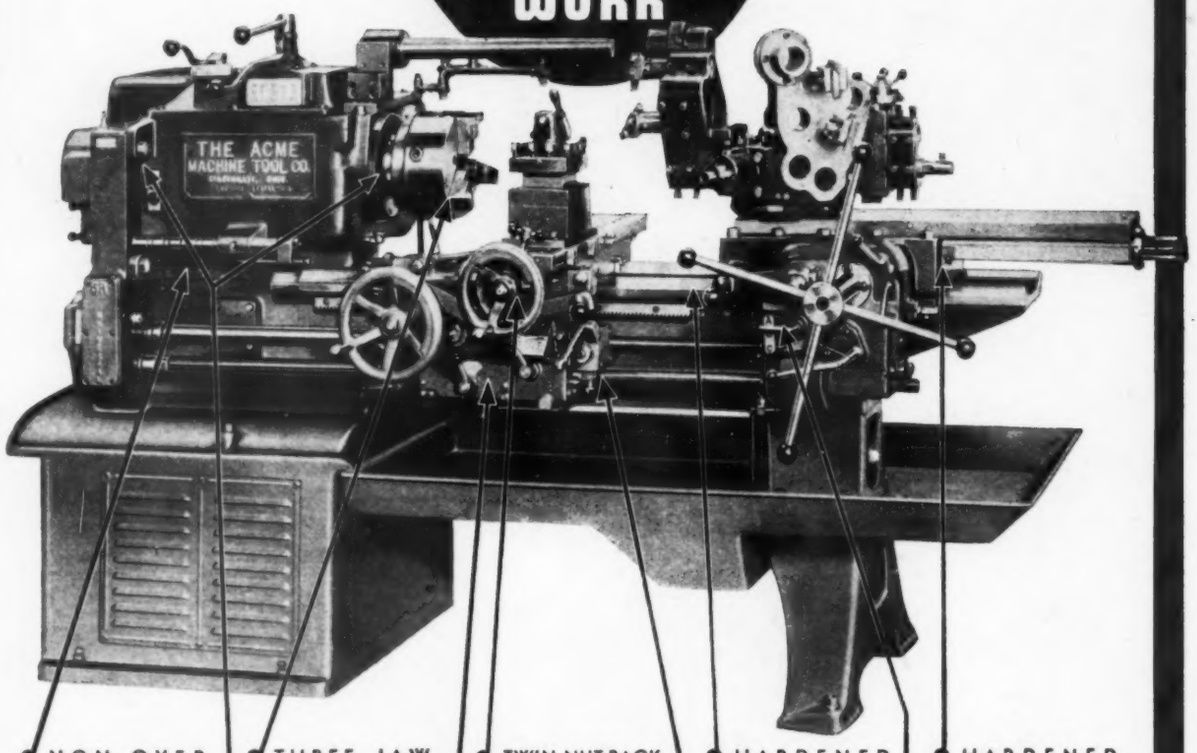
Progressive Cylindrical
Plug Gage

Gear Rolling
Inspection Fixture

ACME *Ram Type* TURRET LATHE

for accurate, speedy - low cost

CHUCKING WORK



- NON-OVER HANGING HEAD STOCK
- THREE JAW UNIVERSAL CHUCK
- TWIN-NUT BACK LASH ELIMINATOR ON CROSS SCREW
- HARDENED STEEL VEE'S ON BED
- HARDENED STEEL RAM SLIDE BEARINGS
- TRIPLE ROLLER SPINDLE BEARINGS
- INDEPENDENT FEED RANGES FOR EITHER APRON
- SIDE CARRIAGE APRON TAPER GIBED TO FRONT BEARING ON BED
- INDEPENDENT FEED RANGES FOR EITHER APRON

This ACME Ram Type Turret Lathe as illustrated is tooled for chucking work. It is also equipped with chasing attachment for cutting from 4 to 32 threads per inch. This attachment is extra and furnished only when required.

This type machine when fitted with automatic chuck and power screw bar feed will accommodate round bar stock up to 2" on the No. 5R machine and up to 2½" round stock on the No. 6R machine.

All of the most important features necessary to maintain accuracy and speed at low cost are incorporated in this design.

For further information contact our engineering department. Write for Bulletin G107A.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

That's Right, My Lad — PLAY SAFE!

ARBORS not in use should be stored in a rack, suspended by the flange, as shown above.

This young catcher has the right idea. He wears a mask behind the bat. He doesn't believe in taking any unnecessary chances.

Many a shop foreman . . . or superintendent, for that matter . . . could learn a lesson from this cautious youngster. For often a shop executive has to "take-it-on-the-chin" when vital production schedules are disrupted.

For example, when a milling machine arbor breaks down, production ceases instantly. Both machine and operator become idle, and their supervisor is in a dilemma . . . UNLESS a spare arbor is immediately available.

So play safe! Keep several spare arbors on hand for emergencies. Remember, arbors are classed as "perishable tools" and their cost today is relatively small.

Kempsmith Arbors in all popular sizes and types are regularly carried in stock. Every one is a precision-built tool, adaptable to ANY make of milling machine equipped with standardized spindle. Fill-in and mail coupon for copy of Kempsmith Arbor Bulletin No. 116.

THE KEMPSMITH MACHINE CO.

Arbors BY KEMPSMITH

Precision Built Milling Machines Since 1888

Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME..... TITLE.....

FIRM..... ADDRESS.....

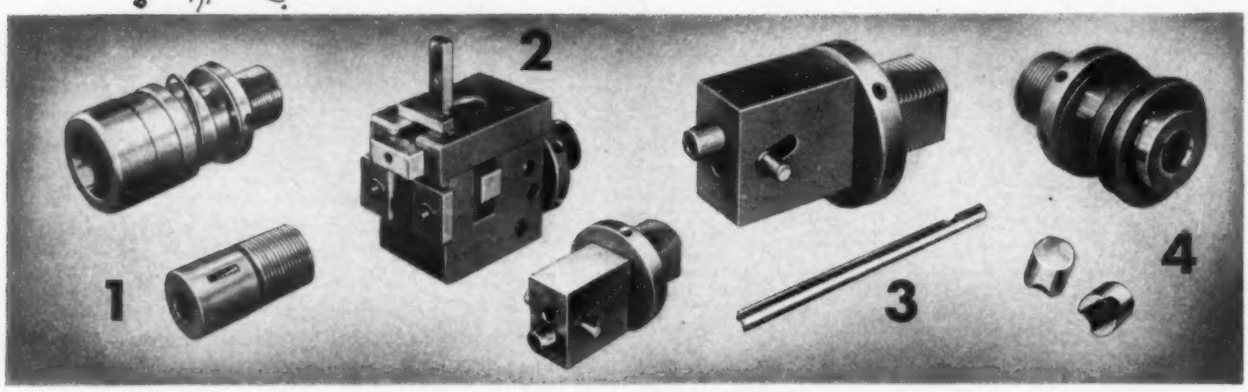
A 4746-1PC

BROACHING *is One Business Where You Need* "PULL"

Be Sure You Have The Right *American* Broach Pull Head

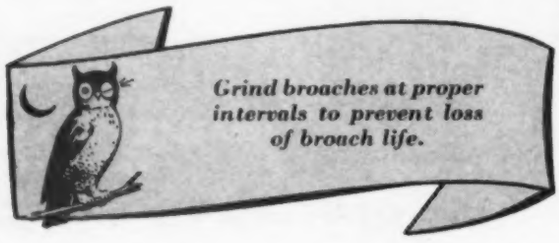
TO GIVE your broaches and broaching machines a maximum degree of operating time, you need quick-connecting broach pull heads. *American* offers a complete line of pull heads—the *right* head for every broaching operation. Each *American* model is designed with a particular purpose in mind. All are engineered and built by broaching experts.

To help you get the most from your broaching equipment, *American* has published an illustrated booklet on broach pull heads and their uses. Write for free copy. It is part of *American's* complete broaching service—machines, tools, and engineering.



Four types of *American* Broach Pull Heads are illustrated. (1) Automatic 4-Jaw Type Puller for horizontal or pull up use. A similar model, with chip shield, is made for pull down use. Standard sizes for shanks from ¼" to 3½" diameter. (2) Automatic Keyway Broach Pull Head for use with keyway square, rectangular, and oval broaches. Broach is rigidly held in proper alignment. Set of adapters permits using old style threaded keyway broaches with this head. (3) Automatic Pin Type Puller for use with broaches having shanks ½" in diameter or smaller. Holds shank by means of a half-round groove cut across the pulling end. Automatically provides positive radial positioning. (4) Type "V" Quick-Change Broach Puller for use with broaches having old style threaded shank. The two-piece jaws are quickly and easily removed while head is in machine. Eliminates necessity of screwing broach into place. Replaceable jaws furnished for all sizes of threads up to 1" diameter.

Slotted type broach pullers and ordinary threaded broach pullers, not illustrated, are also available.



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DIVISION OF SUNDSTRAND MACHINE TOOL CO.

1 step instead of 5

and Alcoa Impact Extrusions give them a finer product

One wallop of the press produces this Alcoa Aluminum impact extrusion —a handle for the Marsh Fountain Stencil Brush. Quite a contrast to the tedious, time-consuming five draws required to make the heavy metal part they previously used.

The fluted outer surface not only dresses up the product, but also provides a nonslip grip. The thick base—four times the thickness of the side wall—takes the punishment meted out when a workman decides to drive a nail with it.

You're many steps nearer the finished product when you start with an Alcoa Aluminum impact extrusion. To learn how they'll fit your processes, get in touch with the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

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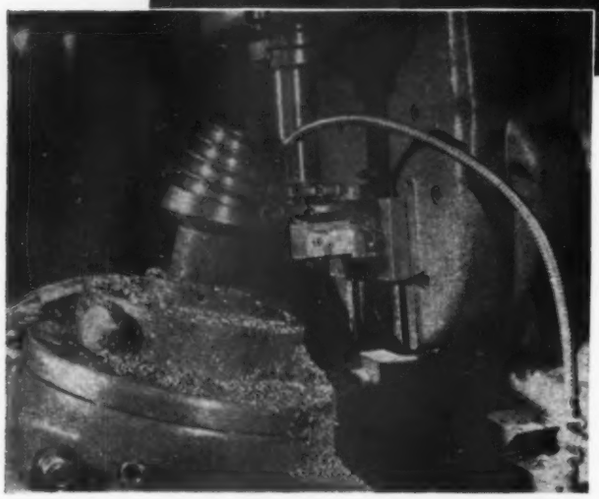
ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

49 TIMKEN BEARINGS help promote speed preserve precision IN THIS UNIQUE MACHINE



The Cross Company, Detroit, Michigan, designs and builds special purpose machines to help industry increase production — cut costs.

A typical piece of equipment of this sort is shown in the photograph. It machines oil well drill bit cutters at the rate of 40 per hour.

This is a rotary machine, the bed revolving continuously. During one complete cycle, each of 6 independent, self-contained stations mills the taper threads on one piece of work. Thus six pieces are finished per bed revolution.

The liberal application of Timken Tapered Roller Bearings — 49 in all — throughout the machine is an important factor contributing to its efficiency. They are used in the cutter heads, on the spindles and at other vital points of precision and hard service.

When you specify Timken Bearings for your machines, make sure the trade-mark "TIMKEN" appears on every bearing that goes in them. The Timken Roller Bearing Company, Canton 6, Ohio.

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TAPERED ROLLER BEARINGS

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How Staples can help you offset them with properly designed tools

To help offset today's higher wage rates, industry faces the need for higher output per man-hour—a continuous flow of *good* pieces right on down the production line.

Staples Carboloy-tipped Circular Cutting Tools, with their *cemented carbide* cutting edges, are the answer to today's problems of higher speeds, heavier cuts and greater precision. Staples Tools—with the hardest cutting edges known to industrial machining—mean less time out for resharpening, fewer visits to the toolroom, less down time on the line. And they give greater accuracy over longer periods of use.

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ASK FOR NEW BOOK
ON BETTER
HOLE FINISH AT
LOWER COST

• New 64-page Staples Catalog-Manual describes the full line of Staples Tools and includes illustrated instructions on how to use circular cutting tools for better results and lower costs.

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Formerly Staples Tool & Engineering Co.
CINCINNATI 25, OHIO

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"Magic-Grip" sheave needs no reaming, no filing, no sledge hammer on oversize shafts . . . grips undersize shafts without weave or wobble. And . . . you need no wheel puller to get it off.

The secret is in patented hub construction. This "Magic-Grip" sheave comes fully assembled, with tapered split bushing of generous clearance for oversize shafts. Yet . . . when you tighten three cap screws, it locks on the shaft with the grip of a vise.

There's no struggle. Anyone can mount this sheave quickly, easily, accurately. It saves time, labor and money . . . can't damage shaft . . . prolongs bearing life because it mounts close, reduces overhang and vibration. And these advantages cost you nothing extra!

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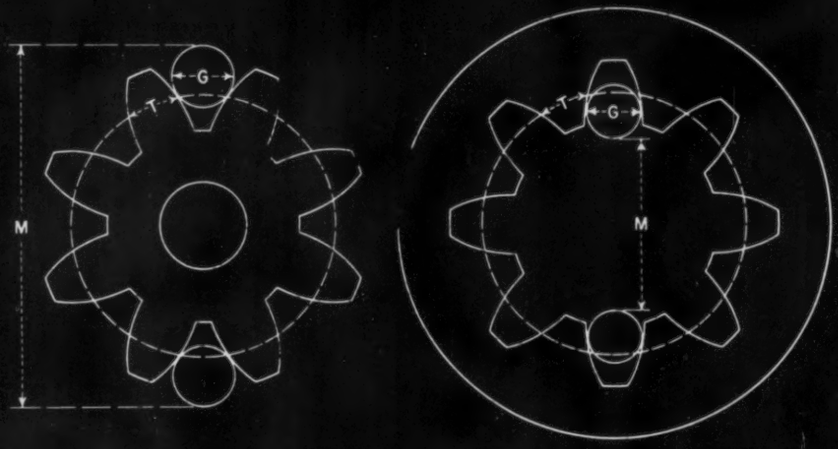

EXTERNAL SPUR GEAR INTERNAL SPUR GEAR

ULTIMATE ACCURACY

Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplified formulas for measuring standard and special threads, splines, gears and worms. Send for Catalog 33 and Circular G 37.

SIMPLE! . . . . The only calculation required is one of simple division.

RELIABLE! . . . . The system is favored by outstanding American Gear Manufacturers.

ACCURATE!.... The Van Keuren 1.68" Gear Tables (Cir. G 37) are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and cutter must be fed further into the gear blank. Exact constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.

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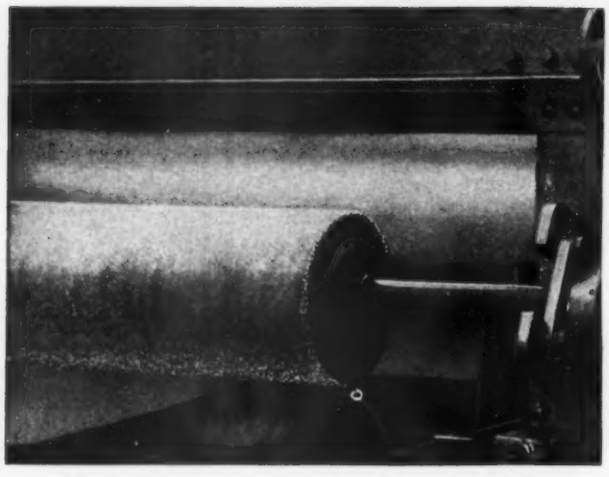
OF ALL TYPES FOR BETTER PRODUCTION *and* MAINTENANCE



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Carefully controlled distribution of the brushing stock gives perfect balance and maximum efficiency to these power driven rotary brushes. Wire or fiber. May be used as individual sections or in assemblies.
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These scratch brushes are uniformly filled. They are trimmed with a "bite" to give the best performance obtainable with hand scratch brushes.
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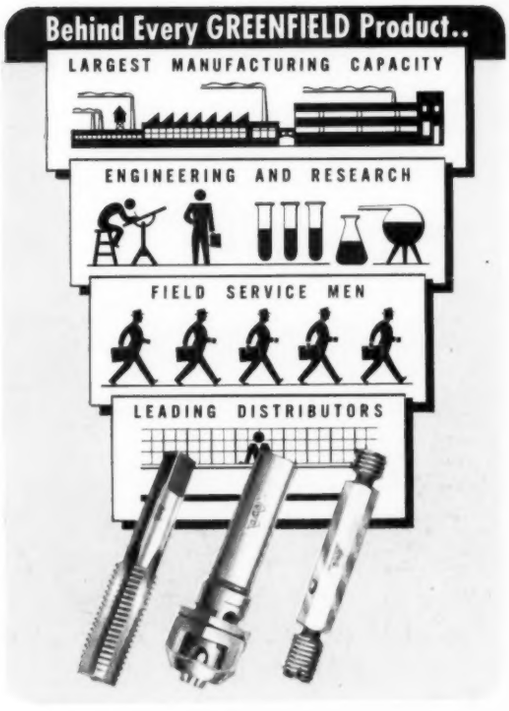

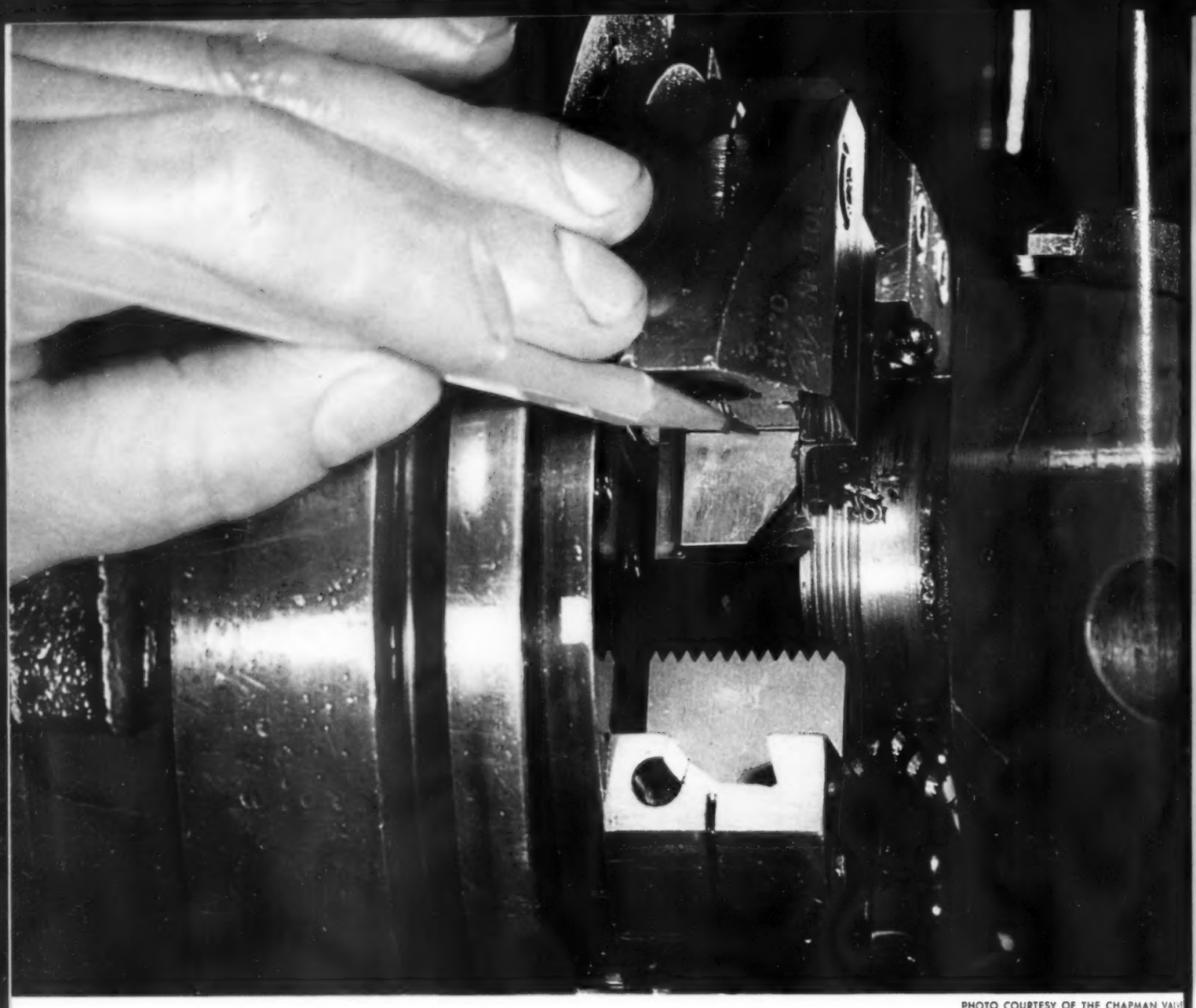

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In addition to the battery of MARVEL Automatics, Hammond & Irving have cutting-off *capacity* of a different sort in their MARVEL No. 18 Hydraulic Hack Saw—capacity for size because this roll stroke giant cuts off billets and bars in 18" x 18". It easily handles the toughest and hardest steels.

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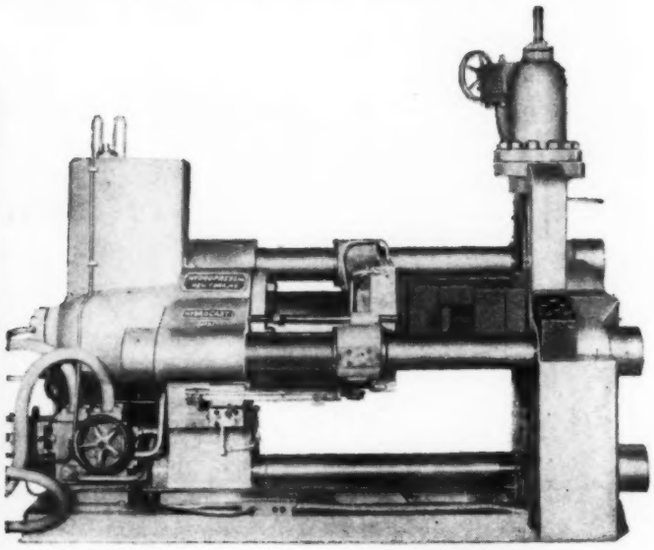

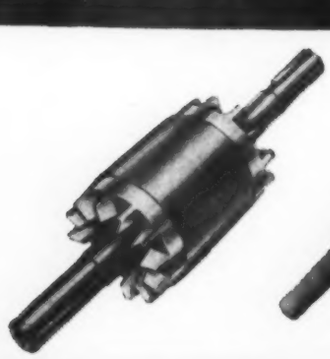

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LITERATURE L-24

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Our engineers are experienced in applying these devices to special requirements. They will be glad to discuss your quality control needs with you. Call our nearest office, or write *Special Products Division, Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

HAS YOUR MACHINERY GOT THE "SHAKES"?

Here's an easy way to help reduce damage to machinery and buildings caused by excessive vibration and thereby reduce noise and improve quality . . . with the G-E *vibration-measuring equipment.* Two indicators measure displacement—the dial-type indicator, and the light-beam type. The velocity meter measures displacement or velocity of vibration. All three are portable, easy to operate, and highly accurate. See Bulletin GEA-4140.

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Highly accurate measurements of rotational speeds from 1 to 60,000 rpm can be easily obtained with the G-E *electric tachometers.* Generators come in three types—heavy duty, general purpose, high speed—all three being self-excited. Instrument is easy to read, because it can be remotely located. Write for Bulletin GEA-4325.

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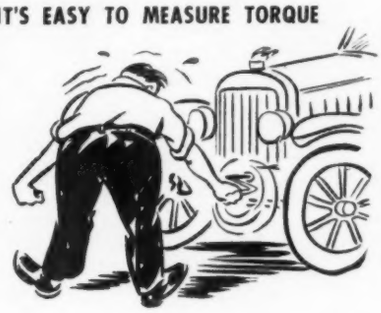

And it's not necessary to cradle the prime mover or load when you use a G-E *electromagnetic torque meter.* It measures torque directly in pound-feet, and it can be calibrated at zero speed. High accuracy; easy operation. Further details in Bulletin GEA-4441.

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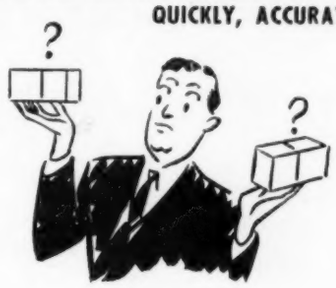
With the G-E *thickness gages* you can measure the thickness of paint, copper plating, sheets of glass, plastics, paper, or any nonmagnetic material. Now you can be sure coatings or sheet materials are of adequate thickness (but not too thick or wasteful). A gage head is placed on the surface, and an instrument indicates the thickness. Three types of gage heads are available covering a wide range of thickness. See Bulletin GEA-4363.

COMPARE FERROUS MATERIALS QUICKLY, ACCURATELY



The G-E *magnetic comparator* gives a quick, simple, nondestructive method of inspecting ferrous parts—such as rods, bolts, springs, and small fabricated parts—for hardness and composition. It tests these parts and compares them to a preselected standard. Helps you to maintain uniform characteristics in your apparatus. Further details in Bulletin GEA-4169.

General Electric Co., Section 800-22
Schenectady 5, N. Y.

Please send me the bulletins checked below:

- ☐ GEA-4140—Vibration-measuring equipment
- ☐ GEA-4325—Electric tachometers
- ☐ GEA-4441—Electromagnetic torque meter
- ☐ GEA-4363—Thickness gages
- ☐ GEA-4169—Magnetic comparator

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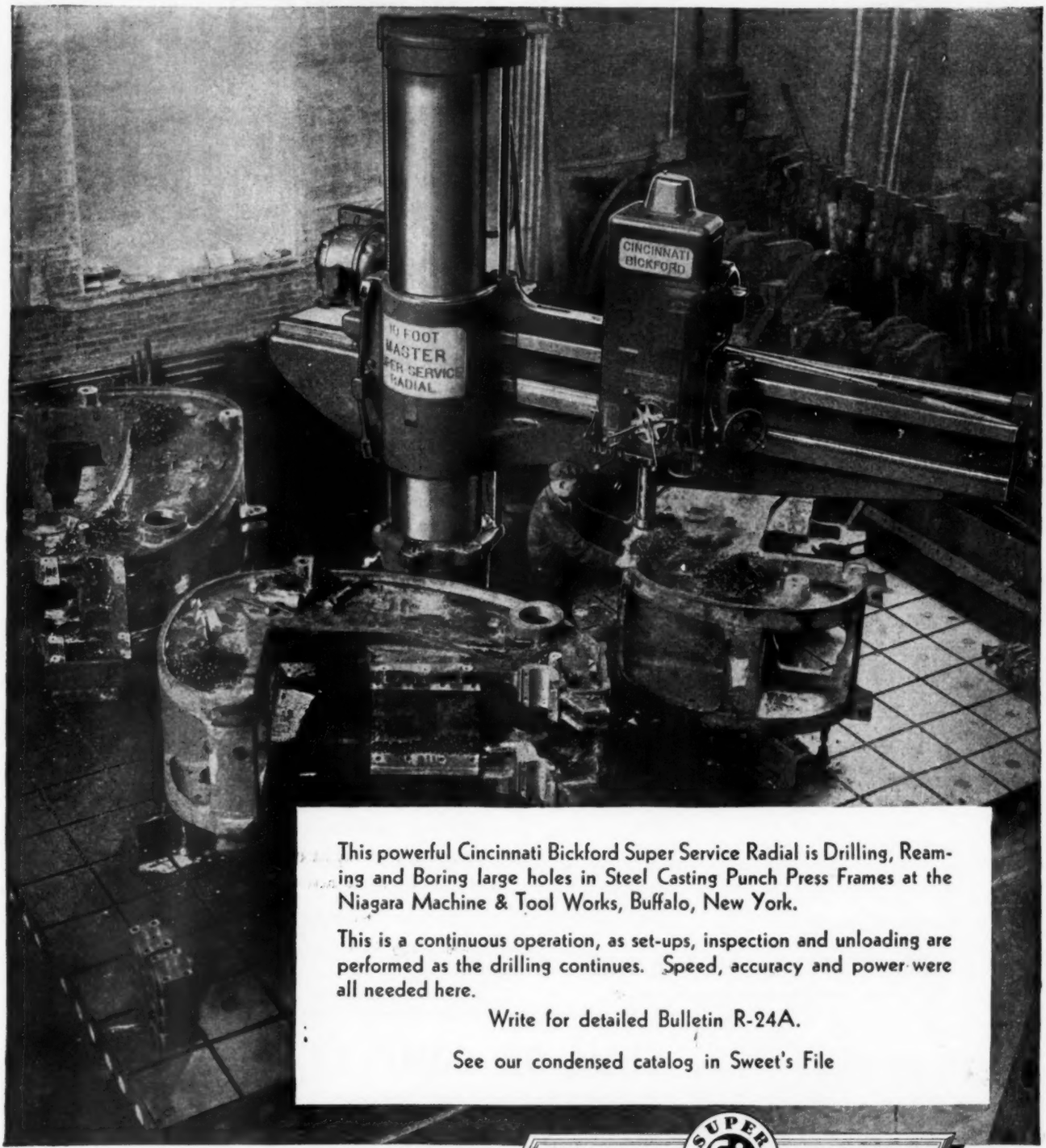
THE machine TO DO IT...



This powerful Cincinnati Bickford Super Service Radial is Drilling, Reaming and Boring large holes in Steel Casting Punch Press Frames at the Niagara Machine & Tool Works, Buffalo, New York.

This is a continuous operation, as set-ups, inspection and unloading are performed as the drilling continues. Speed, accuracy and power were all needed here.

Write for detailed Bulletin R-24A.

See our condensed catalog in Sweet's File

Courtesy of Niagara Machine & Tool Works, Buffalo, N. Y.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

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HERE is an entirely new service designed to help you achieve more production from engine lathe equipment.

This book is the only one of its kind to combine, in one volume, the information that will bring managers, supervisors, operators, instructors, and beginners up-to-date on the complete function of all types of engine lathes.

Far more than a summary, this book utilizes a new technique in picture-and-word presentation. Nearly a thousand drawings, sketches, and photographs are used. Moreover, by combining pictures and definitions in chart "families", relationships and differences are brought out with but a fraction of the study time normally required.

Put this book to work for you! Send for your copy today . . . use the coupon below.

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Here are the chapter headings:

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2. Features of Similarity of Modern Lathes.
3. Getting Acquainted with an Engine Lathe.
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5. Performing Common Lathe Operations.
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American Machinist's Spot NEWS OF METALWORKING

Britain's purchases of U. S. machinery will jump to more than $120,000,000 a year with aid of the loan. First demand will be for machine tools and heavy presses, with orders topping $16,000,000 a year. Machinery buying by Britain in America has been at rate of $36,000,000 annually. Total volume of U. S. exports to Britain is expected to be $1,100,000,000 a year through 1948, or more than double the amount in 1938, the last full prewar year.

All British buying will continue under strict government control. Imports will be carefully licensed, with only essential goods not produced at home or at hopelessly tardy delivery dates on the allowable list. All dollars will be allocated by central government committee partly on extent to which U. S. firms establish British branch plants.

Army and Navy wish to retain some 50,000 machine tools, but certain WAA officials think that that is too many. Latter complain that policy of services deprives WAA of key machines which buyers need to complete their production lines. WAA would like services to lease to private industry the machines earmarked for retention, but services are lukewarm to this suggestion.

Automotive hardware shortages are the latest worry of automobile companies. These shortages, which have cropped up in several plants, are caused by inadequate die casting facilities.

> A West Coast gray iron foundry is shipping flywheel castings into Detroit in carload lots. Smaller iron castings are coming into Michigan from foundries in Troy, N. Y., St. Louis and two Oklahoma cities. It is possible for these foundries to meet Detroit costs due to differences in wage scales compared with Michigan rates.

Machine tool plant of Schiess at Oberkassel, Germany, will be removed to France and other heavy machine tools from Schiess for repairing naval ways and ports will go to Yugoslavia. Machine tool factory of Wagner & Co. at Dortmund has been allotted to India, with some equipment perhaps destined for Britain. Boehner & Koeholer factory at Esslingen has been awarded to Belgium. Other machine tools in German plants are earmarked for Australia, Denmark, Norway and Albania.

Britain has secured badly needed machine tools from the German works of Fritz Mueller, Waldrich, Heniel & Lueg, Jurbelwellenwerk and Hanseatische Kettenwerke. Procedure for disposing of German reparations plants will be for the government involved to sell machines at prices roughly the same as those ruling in the country for corresponding machines in the same second-hand condition.

Orders for plastic injection molding machines continue to run far ahead of productive capacity. Builders still are farming out work in an effort to catch up with demand.

Railroad freight cars are so critically short that government agencies are formulating plans for financing production of 50,000 units and for putting heat on CPA to get sufficient steel allocated to build them. Car builders are operating at a small fraction of capacity because they cannot obtain steel. Backlogs amount to only 33,000 cars. Rail officials say that there is little incentive to place orders with deliveries so slow.

Scrap supply at steel mills is more precarious than in 1942, when a national scrap-collecting campaign was staged, reports President C. M. White of Republic Steel. If scrap flow remains at current rate, mill inventories will vanish in four to six weeks.

CIO's proposal that President Truman call another labor-management conference to stabilize the economy has been received around Washington like a helping of cold mashed potatoes.

Russia would like to buy in U. S. these kinds of equipment: railroad transport equipment; steel forging, press and rolling mill machinery; electric furnaces and electric generators; petroleum drilling and refining machinery; coal and other mining machinery; air-conditioning and refrigeration machinery; machine tools; and port and cargo handling machinery. Purchases hinge on a $1,000,000,000 loan to Russia, which Washington believes Congress will not grant at this time.

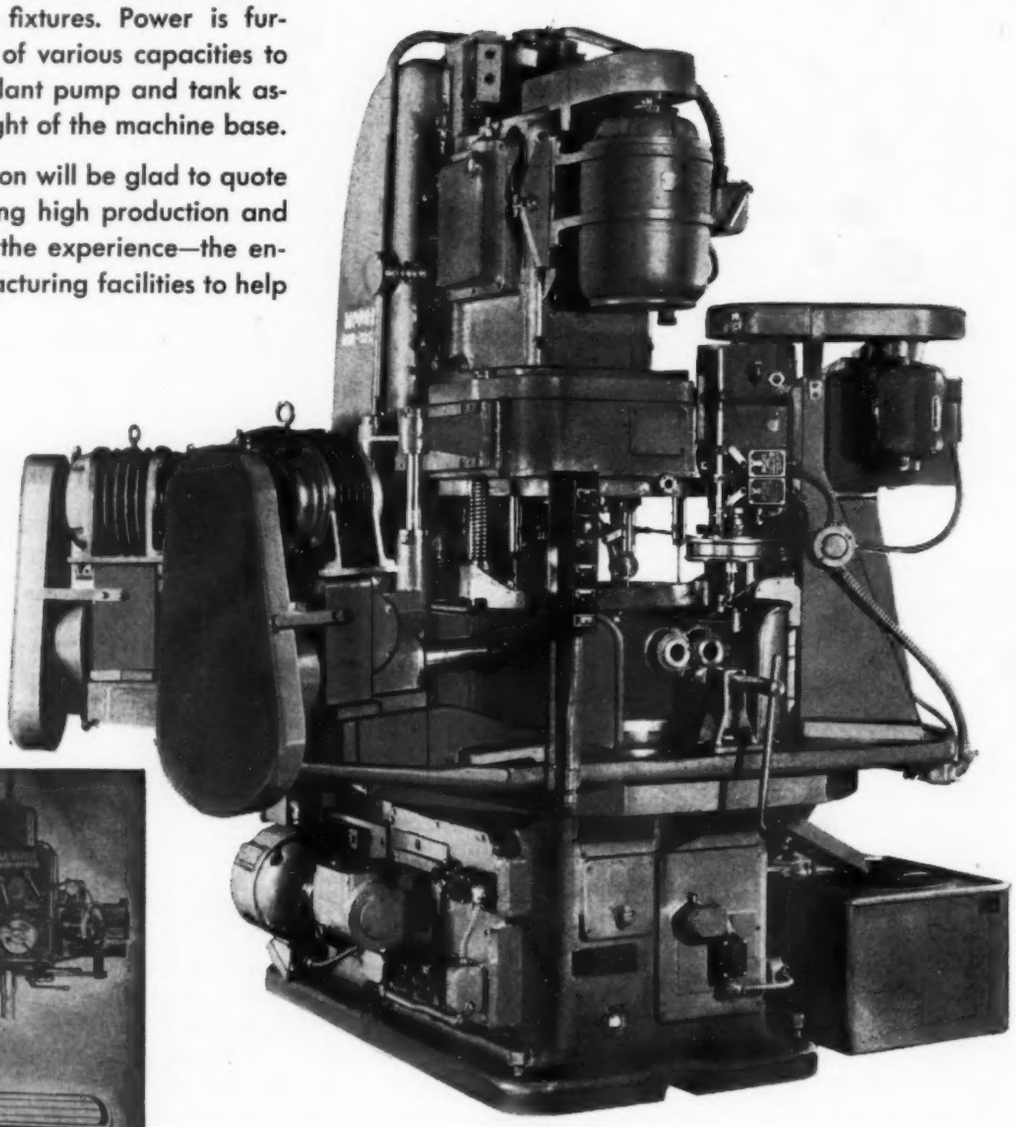
Now you can boost your Production . . . Cut Costs

MORRIS MOR-SPEED High Production Machine

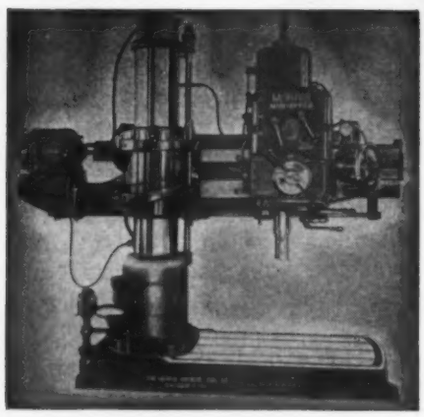
● Showing one of a battery of Morris Mor-Speed High Production machines developed for performing several operations simultaneously on automobile transmission parts.

This is a Hydraulic Vertical Multiple Drilling, Boring, Reaming and Tapping Machine complete with six station automatic index. There are seven vertical spindles for drilling, reaming, facing and chamfering—plus three horizontal boring spindles and one tapping spindle. It is equipped with six double holding and hand clamping fixtures. Power is furnished by six motors of various capacities to meet unit needs. Coolant pump and tank assembly is shown at right of the machine base.

The Morris organization will be glad to quote on your work requiring high production and low costs. They have the experience—the engineering and manufacturing facilities to help you.



Morris Mor-Speed Radial



Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

Labor Holds the Key

This headline struck us forcibly the other day, "Bring prices down by producing the goods!"

It was on the front page of Labor's Monthly Survey for July, issued by the American Federation of Labor.

As we looked closely through the paper we discovered this advice to American workers:

"Produce: turn out all the goods you can: Whatever you produce will help to flood the market with products you want to buy and bring down the price you pay.

"Improve efficiency at your plant. Look ahead. You will want a wage increase later on and you want to avoid a strike. Put this proposal to your management: cooperation of union and management to increase production per manhour and prevent waste.

"Increased efficiency is the way to higher wages, lower prices for the consumer, a better market for your product and a more secure job for you."

We blinked, for much of this might have been issued by the National Association of Manufacturers instead of by the AFL.

Reading on, we came upon this statement which would arouse a chorus of "amens" from industrialists:

"Traditionally America has paid for rising wages by increasing productivity, and this is the only way to raise living standards. . . . We must begin at once to increase productivity so the next wage increases can be paid without raising living costs."

On still farther we read that "today America's ability to raise wages without increasing prices and living costs depends on increasing productivity in civilian industries. We start now with a deficit to make up. Every effort must be exerted to make up this productivity deficit and swing our industries back to their normal progress which can raise 'real' wages and living standards.

"This can only be done by the same cooperation of management and labor that created our productivity miracle in war industries."

And then came the final bit of advice: "Here is the challenge to free labor and free enterprise today: Cooperate to increase productivity and raise living standards without strikes."

Only someone who believes in doctrines foreign to American could quarrel with these policy statements made in an official organ of the AFL.

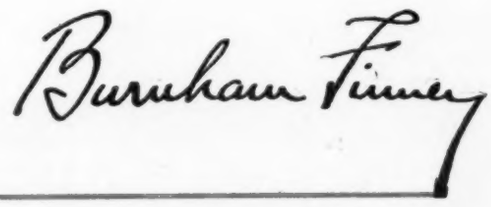
While the AFL is expounding these doctrines, the CIO is giving evidence here and there of subscribing to them. Walter Reuther has publicly said that the United Automobile Workers should help increase production. Other union officials in the CIO ranks have at least privately expressed the opinion that efficiency of manpower must rise.

These declarations of intent give hope that the leaders of organized labor at last realize what a period of full production and no strikes will do to keep down prices and keep up the take-home pay of employees.

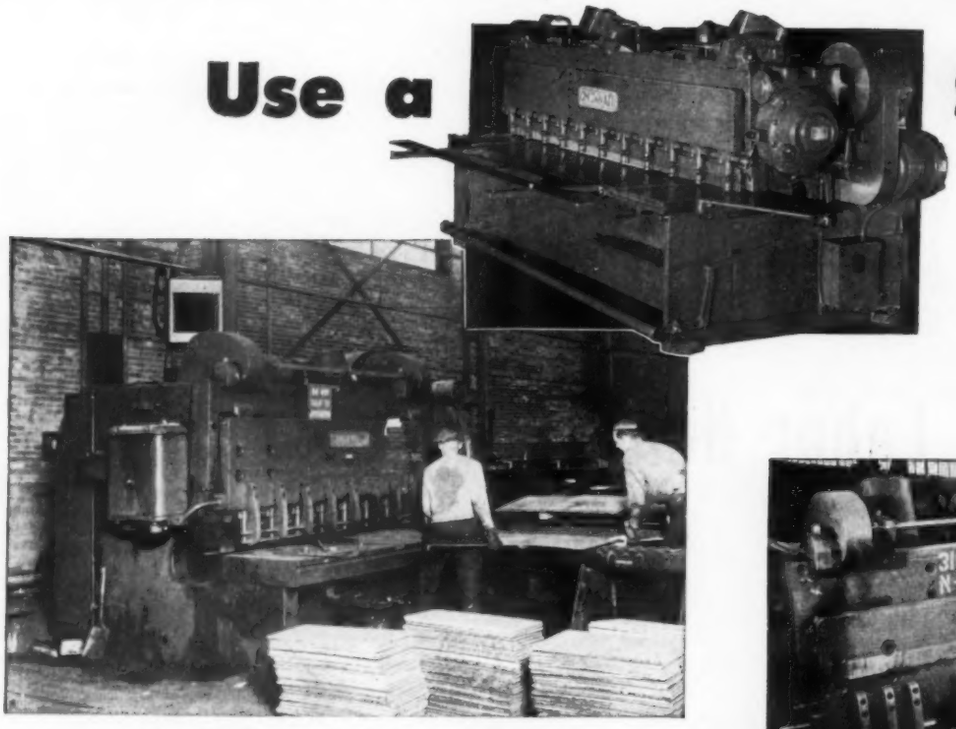
That is exactly what industry wants. National polls show that it is what the public wants. Now comes tangible evidence that it is what union labor wants.

Of the three interested parties, labor holds the key. It can make or break the policy. It is our fervent hope that both the AFL and the CIO will practice what they are preaching.

If they do, we shall be bringing into action one of the most powerful deterrents to inflation.

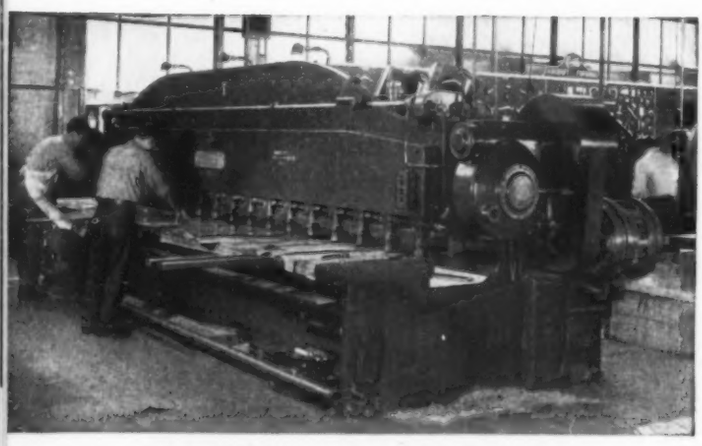


Use a SHEAR



FOR ARMOR PLATE AND ALLOY STEELS

FOR HEAVY PLATE



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SHAPERS · SHEARS · BRAKES

Templet or Model FOR PLANT LAYOUT

By R. W. MALLICK, Section Head
and J. H. SANSONETTI, Staff Supervisor
Headquarters Plant Layout and Materials Handling Section
Westinghouse Electric Corporation

Huge plant investment can be protected by planned layouts. Templets, models or both will save money, time and headaches

EACH YEAR American industry invests millions of dollars in new plant facilities or in plant alterations. The plans for these huge investments usually take form by the application of one or more of four accepted planning mediums: (1) block templets, (2) two-dimensional templets, (3) three-dimensional models and (4) templets-model combinations.

In the early years of industrial planning the location of equipment was a matter of spot selection as the boss walked around the available shop space. Sequence of operation and balanced machine loading were more or less unheard of then. Plant layout often consisted of the physical maneuvering of machines until a satisfactory arrangement was chosen.

The principal concern was, "Is the space large enough to accommodate the machine?" Later on, someone conceived the idea of making these arrangements on paper with a plan of the floor space, drawn to scale, and rectangular blocks of paper representing the equipment.

The templet used in these crude layouts, known as the block templet, was cut to represent the floor space to be occupied by the machine required to perform the particular operation. But difficulties in this method were soon encountered. As no allowance were made for clearance of tables or other moving parts, service facilities were often overlooked.

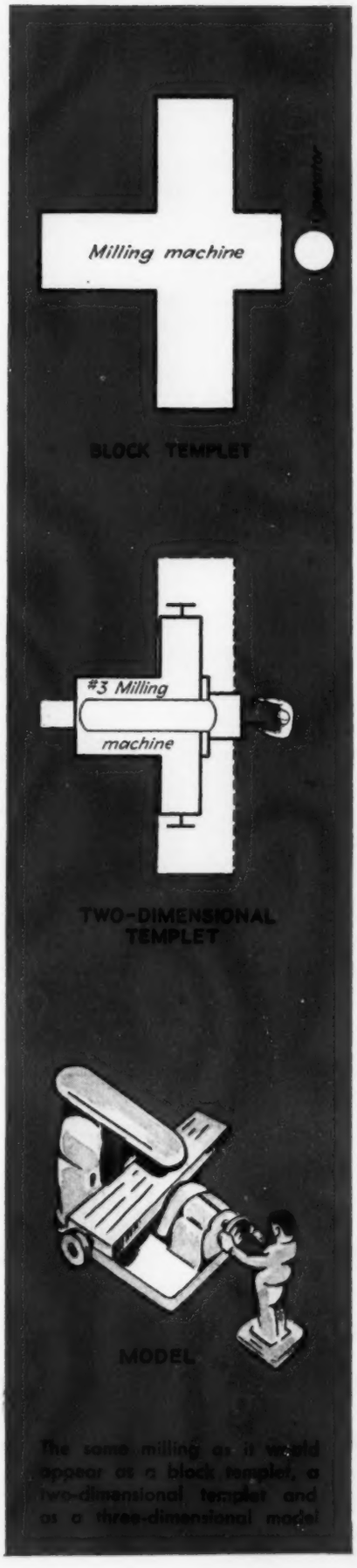
To overcome this trouble, the block templet was often cut larger to take care of these needs. Then it was found that this too was unsatisfactory, because machine areas apparently overlapped or a considerable amount of floor space was wasted if these block templets were spread out. Nevertheless, for the want of a better method, this unsatisfactory practice continued for some time.

As the limitations of the block-templet system of layouts became more apparent and the need for more accurate layouts increased, the desirability of a better templet was felt. This gradually led to the development of the two-dimensional templet.

Shows Contours and Clearances

This templet is basically a small-scale outline drawing of the plan view of the machine, drawn to include all contours with principal outlines taken at operating level. Clearance allowance, such as table movements, were dotted in as required. Actually, the templet presented an outline drawing of the machine, showing actual floor space requirements as well as working area.

This templet has a decided advantage over the old block templet. From the viewpoint of accuracy, it is far superior. The fact that it is an outline drawing of the machine contri-



The same milling as it would appear as a block templet, a two-dimensional templet and as a three-dimensional model

buted a great deal to the understanding of the layout.

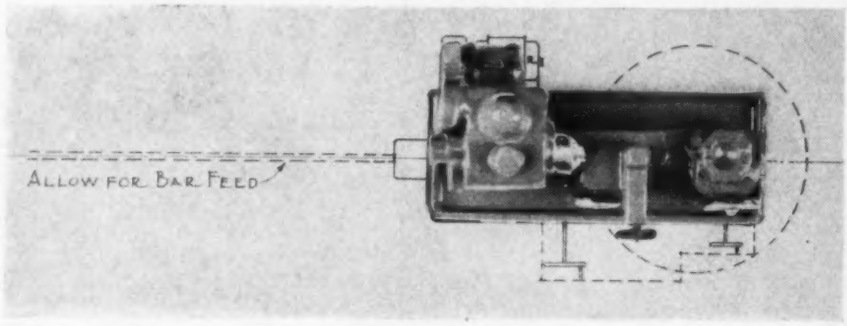
The increasing complexity of plant arrangement began to present new problems. The need for unobstructed traffic movement through aisles, space for material in process, allowance for materials-handling equipment such as conveyors, etc., began to receive recognition in plant planning. This equipment had to be considered in the layout.

In industries where operations were not of a progressive nature, a large amount of temporary set-down space is sometimes required. With templets representing skids, trays or storage areas, such space could be easily computed. As an aid in the development of these requirements, the two-dimensional templet is invaluable. It clearly shows the floor space occupied by machines and that which is available for other purposes.

As far as the templet itself is concerned, the amount of detail shown within the outline of the machine is a matter of project requirements. Most plant-layout engineers are satisfied to show enough detail so the important parts of the machine are easily recognizable. Center lines and easily accessible fixed points are important. It is from these fixed points that millwrights determine measurements for installation of the equipment.

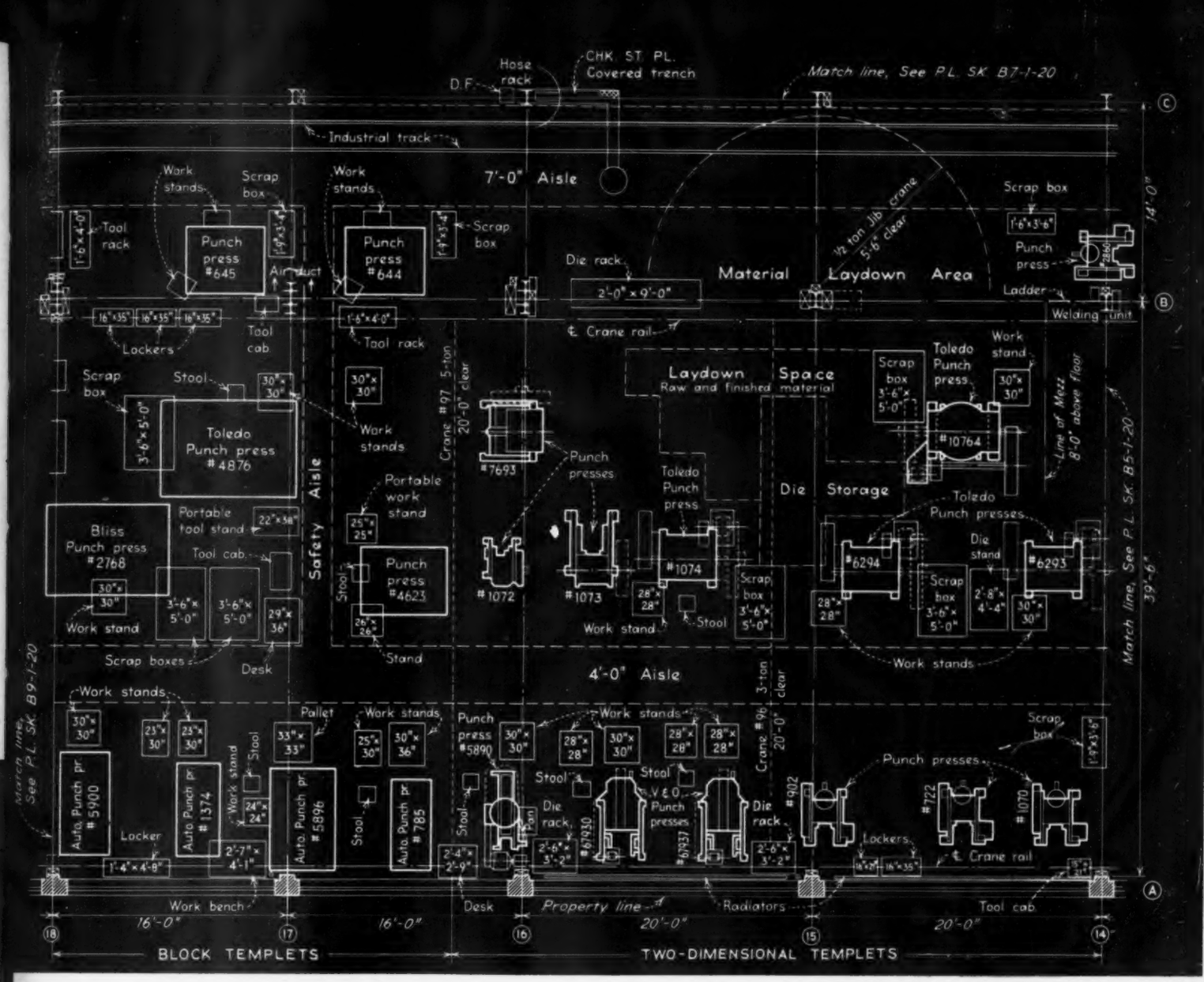
Even though development and use of the two-dimensional templet marked a great forward step in plant-layout work, there appeared to be something still lacking. In most cases, plant-layout developments had to receive final approval of top management.

Use of a two-dimensional templet and a three-dimensional model gives full visualization and machine clearances of a turret lathe



PLANT-LAYOUT COMPARISON CHART

	BLOCK TEMPLET	TWO-DIMENSIONAL TEMPLET	THREE-DIMENSIONAL MODEL	COMBINATION OF TWO-DIMENSIONAL TEMPLET & THREE-DIMENSIONAL MODEL
COST	Low first cost. Can be made by inexperienced personnel	Requires services of a fairly skilled draftsman with a knowledge of machine tools. First cost considerably higher than for block templet	Requires skilled model maker to make special. Most models not yet available commercially. Cost of models in quantity not appreciably higher than good two-dimensional templets	Initial cost of this method combines the cost of two-dimensional templet and three-dimensional model
ENGINEERING VALUE	Very poor. Does not permit good visualization of layout or effective arrangements	Good. This type of templet in the hands of a proficient engineer permits very effective layouts. Does not permit easy interpretation of the layout by non-technical personnel	Good. Makes faster development of equipment arrangements for effective layouts. Helps to "sell" the layout	Best. Combines all the merits of two-dimensional templet and three-dimensional model
ADVANTAGES	Can be made quickly at very low cost	Gives a very accurate layout and reduces time required to make final drawings. Clearly indicates actual floor areas required. Serves as a permanent templet when properly made. Greatly reduces possibility of errors as compared to block templets	Aids visualization of layouts by non-technical personnel. Various arrangements can be made quickly at very low cost. The various schemes can be photographed for comparison studies. Models can be used indefinitely	Permits highly accurate layouts to be made quickly with complete engineering details. Gives full visualization of layout. Only one set of models necessary to make any number of layouts. Reduces layout and drafting cost
DISADVANTAGES	Does not provide for accuracy of layout, effective arrangement or economical utilization of floor space. Increases drafting time and cost of engineering drawings. Fosters discrepancies and errors. Increases over-all layout cost	Cost is considerably higher than block templets. Does not provide ease of perceptibility inherent in models. Requires engineers to carry mentally all planning in the third dimension	Does not carry the engineering information provided by the two-dimensional templet. Does not show machine clearances required for operation or services. Increases drafting time	Highest initial cost of any method



Advantages of two-dimensional templets over block templets are shown in this layout. Note the overlap of various equipment items in the section using block templets

There were instances where some officials did not clearly visualize the picture before them, and the lack of perspective vision often lead to a misunderstanding of the proposal.

Models Aid Visualization

Obviously, one of the ways to overcome the difficulty is to present the problem in the third dimension. This brought about the development of the three-dimensional model for plant layout. The problem then is to make a miniature reproduction of the machines involved. Models made to scale of ¼ in. to 1 ft. are found most satisfactory for this purpose. Sufficient detail is included on the model to make each machine easily recognizable, both as to type and manufacturer.

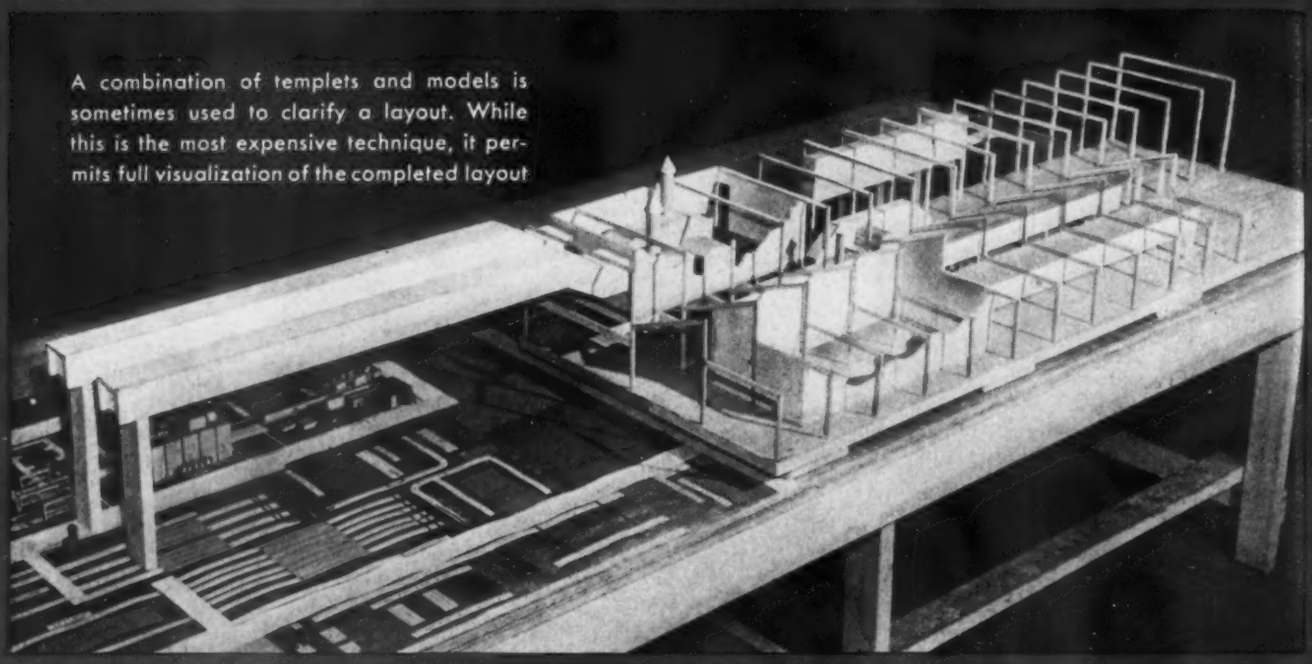
The presentation of plant-layout problems by three-dimensional models has many advantages and, as shown by the chart, fills a gap in layout techniques. Proposed layout at once assume depth and show clearly the future arrangement without the lack of perception present in the flat-templet scheme.

At this point the matter of recording for future reference the proposed plan, as shown by the model layout, comes up. This can easily be solved, however, by photographing the layout as shown and any subsequent changes in it. Then, when final arrangement is achieved, the entire plan can be again photographed and used as a guide by the millwright. For permanence it is usually recorded on drawings by the layout draftsmen.

A more recent development in plant-layout work is the use of a combination of two-dimensional templets and three-dimensional models. After the plant-layout engineer develops a scheme for his layout from the data collected, he makes a layout of the proposed arrangement with accurately drawn two-dimensional templets, upon which are placed three-dimensional models. This permits quick and accurate arrangements to be made.

On these templets is noted such information as name, type and weight of machine. To the layout engineer this gives a complete picture of the plan. But for the benefit of those who are not as accustomed as he is in reading such a presentation, the three-dimensional model of the same machine provides this "picture." The method combines the best characteristics of both previously described schemes. First of all, it gives the complete information concerning each machine and then presents a three-dimensional picture showing the plant as it will appear when finally completed.

In general, the block templet represents the lowest cost factor from the standpoint of preparing a tem-



A combination of templets and models is sometimes used to clarify a layout. While this is the most expensive technique, it permits full visualization of the completed layout

plet for plant-layout use. As a block templet is essentially a rectangular area representing the floor space covered by the machine, little or no skill is required in making such a templet.

In making a two-dimensional templet, which is a true representation of the machine contours and its details as well as any clearances required, a knowledge of machines and their operation is important. This means that a draftsman or engineer of higher skill must do the work necessary to produce the templet. The accuracy of the two-dimensional templet, however, eliminates the danger of inaccurate layouts present in the block-type templet and thus compensates for the extra cost involved.

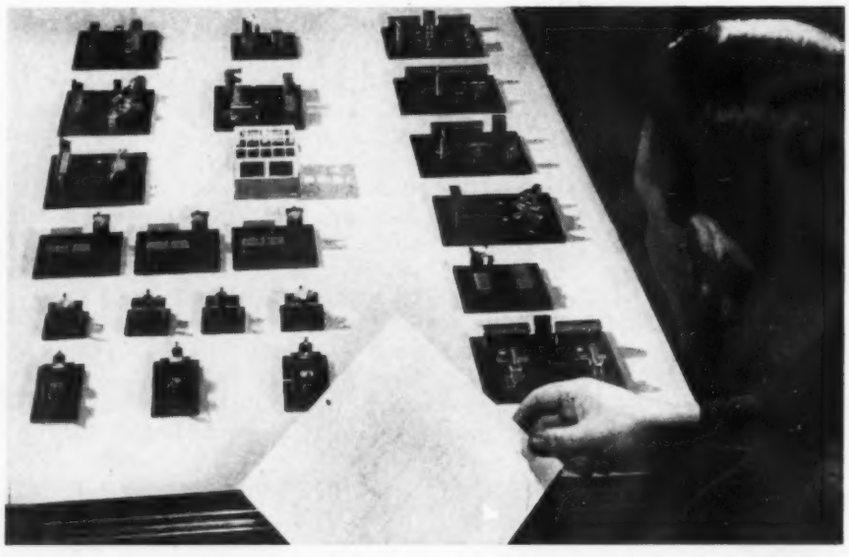
Model Cost Can be Saved

In contrast to the preceding two methods, the three-dimensional model for plant-layout purposes represents a somewhat higher cost. This cost results chiefly from the investment in the models themselves, but as more of these models become commercially available through increased use, a corresponding reduction in cost will result. Then too, once the model is purchased, it will last for the life of the original machine and can be used repeatedly.

The two-dimensional or the block temple on the other hand is usually disposed of after a layout is completed and has to be made over again when any further plant charges are contemplated in the future. If a model of all machines in the plant were available and kept in the plant-layout department or works engineer's office, it can be readily seen how quickly plant layout inefficiency can be shown and corrected.

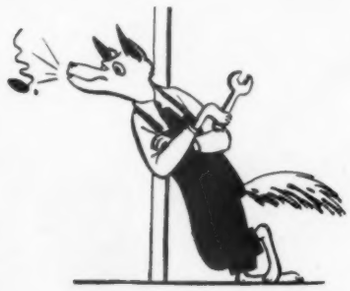
For those industrial plants where large layouts must be studied in great detail and where investments involve large sums of money, a combination of two-dimensional templets and three-dimensional models is recommended. Although the initial cost is higher than the other methods proposed, the overall cost is lower and layouts can be made more quickly and accurately, because errors are eliminated and changes quickly made. An added advantage of this method is that it presents the most complete picture of all which often is important in "selling" the layout.

It is the usual practice of most companies to record layouts as engineering drawings. The resulting drawing and the cost to prepare it will depend largely on the accuracy and detail of the template layout. Often, pennies saved in making templet layouts are offset by dollars lost in additional drawing-room time. Only the best layout is the cheapest.



These sections, representing an entire group of machines, can be used to plan to flow of materials through a new plant. Detailed layouts of each section are also made

TALKING SHOP



Wolf Whistle Stop

AMERICAN GEAR, Houston, Tex., was haled into court by the irate proprietor of a cleaning plant next door. He demanded an injunction restraining gear workers from whistling, explaining that the latter indulged in wolf calls that "annoyed" his wife and female employees. District Judge Roy Campbell held that it's every man's right to whistle while he works. Then he let out a low, vibrant, wolf whistle. "That," he declared, "you must not do." How about reciting Little Red Riding Hood, or tuning in on "Peter and the Wolf," Judge?

A Friend In Deed

IF ANOTHER plant executive, sometimes a competitor, comes to you for advice, help or hard-to-get parts, do you kick him in the teeth? Or do you take him aside and give out because you know he is really stuck? Profiting by experience during the war, several plant managers claim that they will always help someone who is stuck because it is almost certain to pay.

Why? Because you know that someday he will repay the favor. And you usually seek this repayment when you are really backed against the wall. The Golden Rule still works.

Light Saving

PHIL PERKINS, pro at Cleveland's ritzy Kirtland Country Club, is selling golf "woods" with magnesium heads and hard-rubber striking faces. American Magnesium is making the heads, American Fork and Hoe the steel shafts. Aluminum was tried in the early 30's, but failed to catch the market. . . . Currently, an expensive alloy of 75% beryllium, 25% aluminum —and about half the weight of aluminum—is being used for strong, lightweight machine parts.

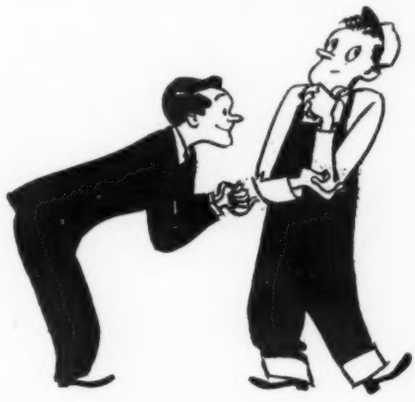
Abroad Measure

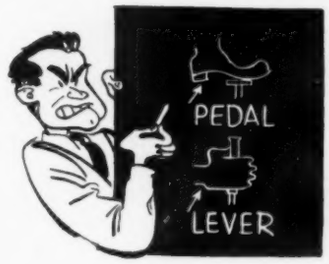
OGDEN NASH, irritated by returning friends who extolled the beauties of Europe, was driven to remark: "Oh Gord, why don't the people who go abrord, stay abrord?" We hereby serve notice that our future attitude will be the same re metric and English measure. We attempted recently to convert a 1.5-mm. ball diameter (for a Russian mini bearing) into English measure on a commuter train. We got several zeros too many, and several queries. Our second conversion (with the *A. M. Handbook helping*) is 0.059. Better?

You can stop worrying anyhow, because a 3-ball American bearing is claimed world's smallest. It's 2.7 mm. in diameter, with balls 1/25 in. in diameter (about 1 mm.). 111,000 of the balls make a pound, they tell us. The bearings are for instruments at Bikini. Next step is to 1/64-in. balls in bearings to reach 150,000 rpm. The newspaper report says tolerance on these balls is a 25-millionth. We'd pass 'em at 25 millionths; anything closer is faith.

Little Helpmates

SINCE the disappearance of the carpetbag—pardon—brief-case type of salesman and the entry of our modern "sales engineer," industrial plants consider it unwise to turn them away without hearing their story. As one production manager sees it, such men are a profitable source of mechanical and tooling suggestions, they scare up urgently required materials, and they even bring in orders for business—particularly to small plants. And quite often they end up by selling you good equipment. Nice people to have around—in fair weather or in foul.





Pet Hate

WE GRIT our teeth over the learned (?) technical men who write "foot pedal," "foot treadle" or "hand lever." Pedal and treadle both incorporate "foot" already, leaving lever to mean a hand-operated bar. Fred Colvin and other lexicographers call that tautology; we call it careless.

New-found Foundry

SINCE V-J Day it has been increasingly difficult to get new men into foundries. Molders are at a premium. Ford is spending a good part of a $10-million foundry reconversion plan in improving working conditions, $80,000 for refrigerated drinking fountains alone. Thousands of feet of balconies were removed to let daylight and sun in and to improve ventilation. Melting furnaces were moved to outside walls to reduce heat on the floor, heat-treating ovens and welding departments put on upper floors for more rapid disposal of heat.

All heavy hand work is being eliminated—charging platforms of furnaces are completely mechanized. New lunchroom and modern toilet facilities are also included in the conversion program, with a completely new system of dust collection.

Wrinkle Remover

Because of its extreme toughness, it was found very difficult to draw or extrude copper-beryllium tubing without defects serious enough to cause failure in service. Original billets were cored, and 3 to 4 in. in dia. by 15 in. long. Finished tubing was oval in cross-section, about ⅛ in. one way by ½ in. the other. It was finally found that defects in finished tubes were caused by wrinkles formed on the inner surface of the billet when the core was withdrawn. Reaming the hole smooth before drawing eliminated the trouble at the source.

Pop Balls Pop. Sam Adams gives a fine imitation of a victim's reactions when he opens a surprise box. In this case, a bushel of 4-in. paper balls jump out of a box about 2 x 4 x 8-in. Half a dozen balls in a box retail at a dollar, are made so cheaply even the Japs and Germans never tried to compete

Adams' "Ribs" Aren't Missing

Seeing is *not* believing—nor do people on the receiving end say always, "It's a joke, Son!"—but Sam Adams has methods in his madness as he fabricates metals, plastics, and other materials into tricks

BY E. J. TANGERMAN
MANAGING EDITOR

WE HAVE been assured, times without number, that engineers and production men are serious-minded fellows who don't appreciate a joke. Maybe that's why we've been handed so many hot slugs, had machine handles greased or white-leaded, sat on so many thumbtacks and been asked to draw with rubber-leaded pencils. Maybe that's why the boys nailed one helper's shoes to the bench, another's apron to the wall, fought duels with oilcans, set buckets of water above doors and shellacked the inside of the watchman's derby. For serious-minded fellows, shop men and engineers take an amazing interest in deviltry—and expend a tremendous amount of ingenuity in fiendishness.

Sam Adams, however, says salesmen are much worse. So are sales executives, theatrical entertainers, dentists and fraternity men. Men past thirty are greater joke addicts than younger men. Californians are ten times as bad as residents of other states (and dozens of times worse than Maine Yankees), April Fool's Day and the year-end holidays the times they are most active.

Sam Adams should know. He's president of the S. S. Adams Company, Bradley Beach, N. J., and top American jokesmith for these last 40 years. His company turns out most of the exploding cigars, squirting roses and parlor magic you see in America's 4000 joke and puzzle stores —or experience at parties. Sam himself has invented over 600 such devices—still turns out about a score a year, so has richly earned the title of the man most likely to be punched in the snoot.

Funny thing, though, he never has. The threat hangs over him, however, made by a Western politician who forgot his most important campaign speech when a cigarette box blew up in his face. Mexico also prohibits many of Sam's best jokes—the Latin temperament gave murder too often after a peek at a supposed naughty picture just ended in a squirt of water in the eye.

Having seen Adams novelties in cities everywhere, we began to realize that his must be a mass-production metalworking plant, with plenty of ideas for other shop men. So it turns out to be—containing the usual toolroom equipment, some 20 footpresses, four power presses, two spanking new Cleveland automatics, Grant riveters, plating tanks, a spray booth, and so on. Examples of the work turned out are illustrated. From 70 to 90 employees (two blind veterans) are kept

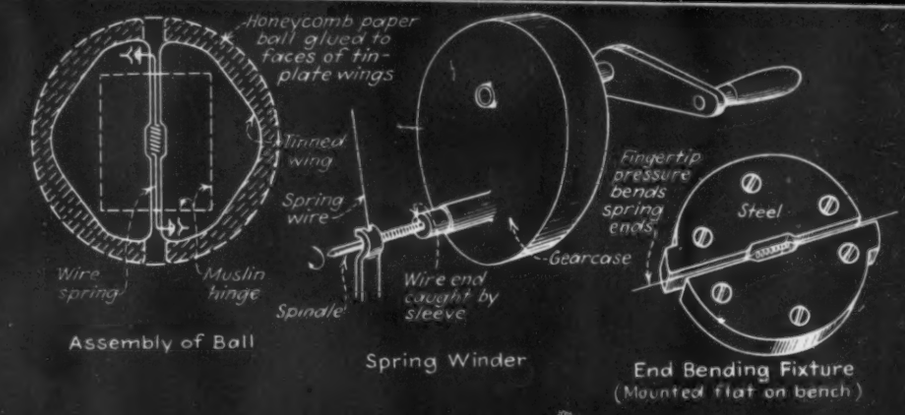
busy fabricating and assembling from a variety of materials. In addition to those you'd expect, there are many newer ones—plastics, rubber, fiber, cellophane. Very confusing tricks are based on Alnico, which has magnetic power so many times its weight that it is readily concealable. Sam's current supply is over three tons, some of which will go into brand-new tricks, the rest into familiar ones like coin changing, "floating" corpses and now-famous pairs of Scotties. It's amazing what Alnico can do to a hollow coin incorporating a disk of steel. (We'd tell you more, but promised we wouldn't tip Sam's hand.)

Most complex product is the Joy Buzzer, patented in 1932. It incorporates a clockwork to operate a vibrator and a cone point, is carried on a ring so it can be concealed in the hand. G. A. Lyon showed it to Henry Ford, who gave "shock" handshakes to foremen all over his plants. Several million have been sold, accounting for a $144,000 profit its first year; and it is still selling in the hundreds of thousands. G. I.'s loved it—one shook hands right into a flock of presents and a witch doctorship in the South Pacific.

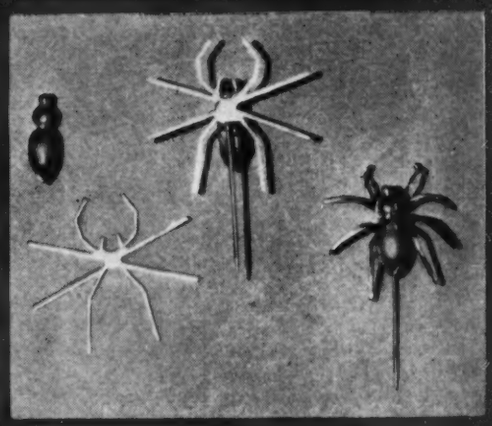
The Buzzer is made on a production line to permit sale at 50 cents, even under current conditions. Price is always a controlling factor in mass-market gadgets. One Adams patent (1931) for Bingo exploding book matches, protected Sam against American competition but not against Japanese. His price of $7.50 a gross was halved by imports and the market glutted before the Federal authorities could stop it.

The Bingo idea, used in matches, cigarettes, books, coasters, folders and dozens of other holders, is a miniature mousetrap which fires a percussion cap. Mr. Adams invented it in 1907—developed a variation during the war as a detonator for road, personnel and other mines, alarm signals and so on. He made the first thousand, then the Ordnance Dept. took it elsewhere for real mass-production. Once set, it detonated if touched, proving much surer than more elaborate devices. Other Adams war products were dies for detecting apparatus, radio and gun parts, and thousands of jokes and puzzles for morale building among the armed forces. These latter were of wood, paper and plastics, because shortages of metal and rubber forced discontinuance of 60 to 70% of the regular line.

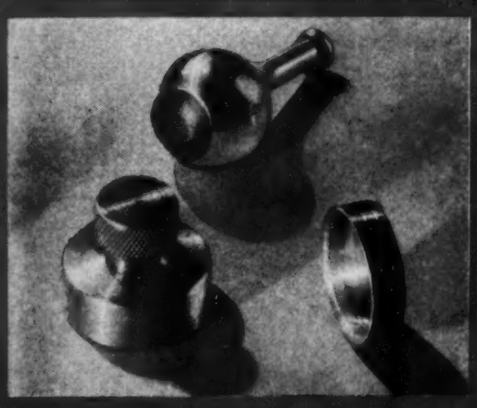
Adams' first product was Cachoo

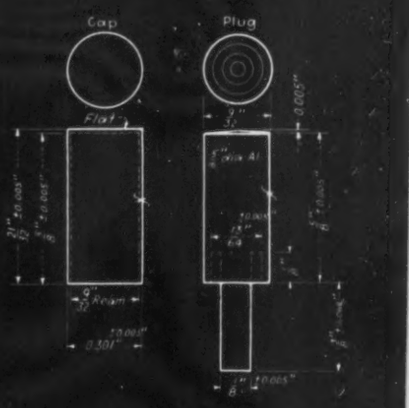


Pop Ball Unmasked. Two thin tinplated steel wings are joined by a muslin hinge and normally forced together by a wire spring crimped into slots at their alternate ends. To their outside faces is glued a honeycomb-paper ball, so the ball is formed when they come together. When folded, it forms a 1 x 2 x 1/8-in. thick crescent, so a dozen can be nested side by side in a small box. Springs are coiled snugly from wire (at a cost far under that estimated by any supplier). The coiling unit is a "hand-grinder" gearbox, with a clamp collar holding and turning the wire as it is guided by an arm. Ends are bent at opposed right angles in an adjacent hand fixture.

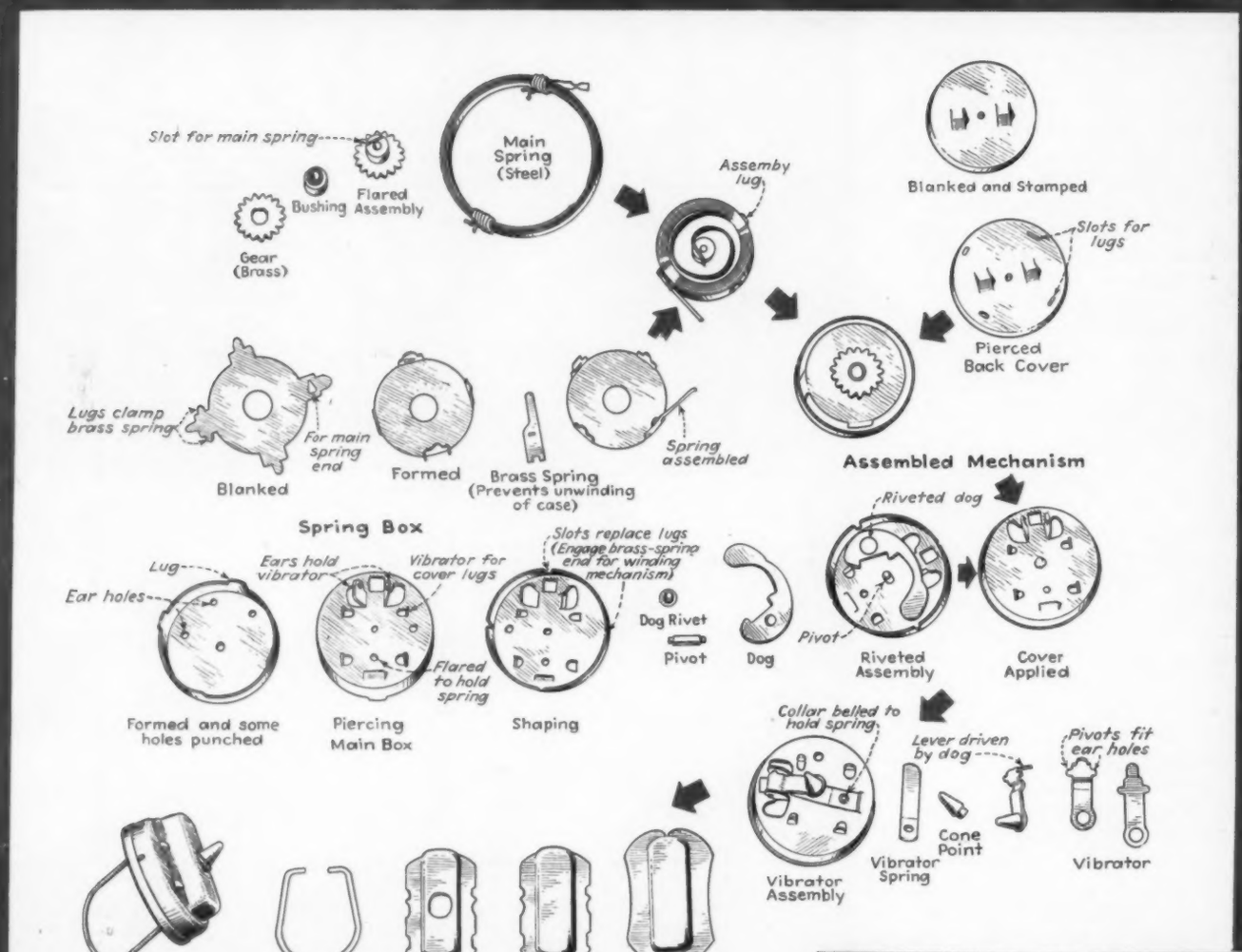


Diabolical Black Widow. This horrendous imitation is assembled from a lead-cast body, sheet-metal legs and a large brass bank pin with bent head. Bodies are poured, 12 at a time, in bronze molds. The leg unit, with proper leg positions, is blanked from thin tinplate in a footpress. The two, and a bank pin, are soldered together. Legs and pin are bent into position, the assembly dipped in lacquer and black fuzz (floc) in turn—and there you are—for a dime. Roaches, bedbugs and flies are similarly made at a nickel apiece. Foreign insects have wire legs, requiring much more elaborate assembly to attain authentic leg positions.





Turned Trades. A lathe and two new automatic screw machines produce turned parts for tricks and puzzles. The Imp Bottle at left, made of aluminum rod, involves end rounding, centering, and two boring operations from the end turret, form-turning and cut-off from the side slide. It can be made at 3000 per hr. (gross), is finished by chrome-plating or spray lacquering. The other two parts are of brass, the right-hand one nickel-plated. Mating dimensions must be accurate to the thousandth, others are immaterial. The sketch shows a pair of mating cylinders of 5/16-in. dia. aluminum rod. The plug, for example, requires 2 screw-machine operations, taking 369 revolutions at 4150 rpm. and producing 675 (gross) parts per hr.



Joy Buzzer Diagram. Long-term popularity has been enjoyed by the versatile "Joy Buzzer" which provides a shocking handshake, a tickle when applied elsewhere—and even doubles for chair or bed shockers. Hundreds of thousands sold before the war for a quarter, yet the mechanism is quite complicated, as the sketches indicate

sneeze powder, a derivative of coal-tar dyes which he once sold. He sold 70,000 bottles at $1 his first year (1906), followed with the Bingo shooter (1907), the Rocket Wireless Message (1908) and the famous Dribble glass. The wireless message was a fake telegram incorporating a whirling rattle, the dribble glass has slots ground through near the top. These and their successors are all designed around a couple of major principles—the unexpected result and physical harmlessness. Even Adams exploding cigars don't explode; they incorporate a tied spring that lets go when the string burns through.

Coiled springs under cambric make the snakes that leap out of jam and cold cream jars, peanut-brittle and nut cans, and so on. Some are 8 ft. long. Other wire products are puzzles of various shapes and sorts—some combined with sheet metal or plastic. All are wound as shown for the pop ball; rings are cut by sawing in the miller over a slotted mandrel.

One Adams product seems a bit out of character. It is a mounted fish—any desired species, mounted or unmounted. Perhaps it is in character, however, because all species are cast-lead fakes, painted so well that one State fish and game commissioner bawled out a dealer for "exhibiting an undersize bass at a sportsmen's show." Fish are cast in bronze permanent molds, made in turn from plaster casts of sculped paraffin.

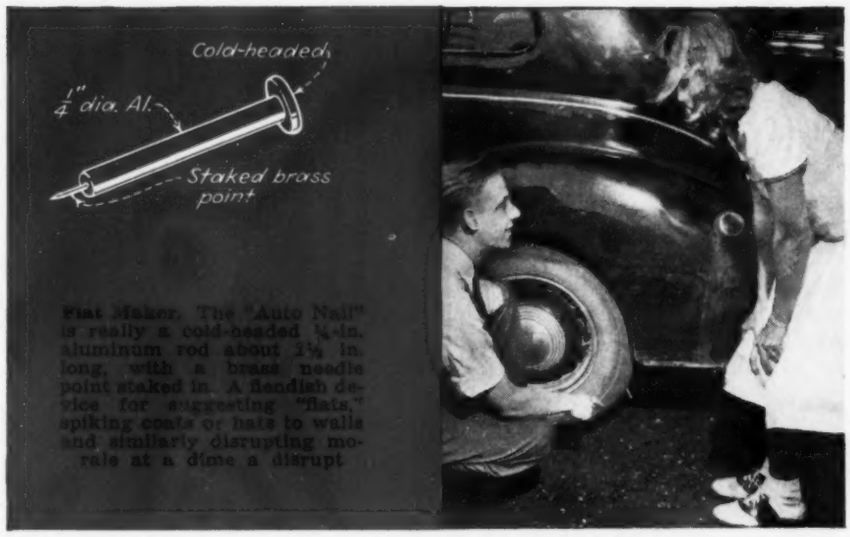
A toothless plastic comb for bald-headed men and a self-dumping steel ash tray (the hinged bottom drops open)—either for a dime—are much more familiar, however, as is a corkscrew with left-hand helix. So too is

the Auto Bomb, which shoots, whistles, discharges black smoke and shoots again when the starter is pressed. This one is no good for weak-hearted maiden aunts—almost no good for a G.I. who put it on his buddy's jeep, then watched in paralyzed horror as a colonel jumped in and got the surprise of his life. It's a lot safer to use a rubber Kiss Stamp on the victim's collar or cheek—an idea Mr. Adams got when his son, Joseph, came home from a party. Now Joseph —who everyone calls Bud—is boss tool and die maker for the plant.

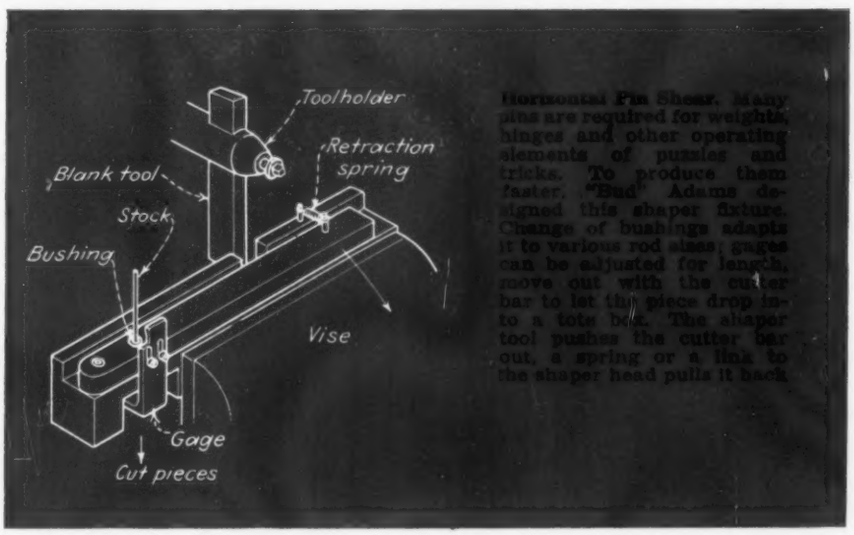
Sam Adams entertained a North Carolina lady and her daughter recently by taking them to their first big-league ball game. Late in the seventh, the lady pointed out that New Yorkers were far more gullible than out-of-towners, accepting as fact any number of things an out-of-towner would rightly suspect, and being particularly susceptible to mob psychology.

Sam agreed, suggested an experiment to test the contention. At the end of the inning, they'd stand up in their seats; "I'll bet," said Sam, "these New Yorkers will stand up too!"

They tried it—and sure enough, people stood up all over the field. Nearby ones promptly caught the tenor of the excited Lady's remarks, and played up. All that worries Sam is that baseball may penetrate North Carolina, lead to a denouement if they follow standard seventh-inning customs.



Fiat Maker. The "Auto Nail" is really a cold-headed ¼-in. aluminum rod about 1½ in. long, with a brass needle point staked in. A fiendish device for suggesting "flats," spiking coats or hats to walls and similarly disrupting morale at a dime a disrupt



Horizontal Pin Shear. Many pins are required for weights, hinges and other operating elements of puzzles and tricks. To produce them faster, "Bud" Adams designed this shaper fixture. Change of bushings adapts it to various rod sizes; gages can be adjusted for length, move out with the cutter bar to let the piece drop into a tote box. The shaper tool pushes the cutter bar out, a spring or a link to the shaper head pulls it back

Scrap Salvage. Uncle Sam had many thousand scrap pieces of plastic sheet like that at left. Nephew Sam bought them, converted them into the grinning Hottentot with colored paints and four punched holes. With a string and ring it becomes an ingenious, inexpensive puzzle

← **Formed Foul Play.** Two sizes of "ink blot"—for fountain pen and ink bottle—are slightly dished and blanked from thin steel on a foot press, then black-enameled. Another similar product is the "Doggonit," a pressed shape for rugs that leads a pup owner to suspect his is a handyman dog—doing odd jobs all over the house. At center rear is an extractor for a clever puzzle, at right one of the many forms of glass-topped boxes containing elements to be positioned. In this case, three ball bearings cover a bull's-eye.

Probability and Quality Control...I

BY EUGENE GODDESS, HEAD OF FACTORY ENGINEERING, NORTH AMERICAN PHILIPS COMPANY

QUALITY CONTROL by the use of statistical methods is usually concerned with sampling a grand lot by testing a number of units—then using mathematical interpretations to give industrial meaning to be results. The basis of these methods lies in the accuracy with which the sample represents the lot. Computations made on the basis of data are called statistics. It is only natural to ask: "What are the interpretations? From where do they derive? What theoretical justification for the use of these interpretations is there for the 'practical' man?"

Statistical methods have proved to be useful tools of inspection. They are based on mathematical relationships which cannot be considered vague approximations

Probability and Precision

In essence, the interpretations state that, on the basis of the test of the sample, certain facts are probably true about the grand lot; moreover, these facts are probably true within definite approximate limits.

Most certainly this is a challenging statement in that it lends an air of precision to an approximation. Let it be stated here: There is nothing vague about an approximation. If it is stated that there is 7 to 12% defective production — and subsequent testing shows that there is 9% defective, then the statement is precise—certainly in the sense that it is correct.

Some will be tempted to ask the same question about the word "probably." A moment's reflection on this point should clear it up. Suppose there are a million springs, and to determine the number defective in the grand lot, a sample of 500 springs is taken. The sample shows 3 defective springs. On the basis of this information I predict that the grand lot will have an excellent likelihood of having 7100 defects or will probably have between 1500 and 18,000 defects.[1]

It will be conceded quickly that if the actual number of defects should lie between 1500 and 18,000, an accurate guess was made. But suppose that a highly improbable situation occurs and that the total number of defective springs in the million is only 107. Obviously the prediction was wrong, but was it an accurate statement? The answer is YES. It was an accurate statement because, based on the sample test information, *there was an excellent likelihood or probability* of the grand lot having the predicted number of defectives. The fact that the number defective was 107 rather than a number between 1500 and 18,000[1] does not alter the situation in the slightest. The probability was there; the fact that the probable thing did not occur indicates in this case that the unexpected occurred.

Probability and Observation

Uses of probability often occur long before their mathematical basis is discovered. Phenomena are often recorded, observed, and utilized for years before either an empirical or theoretical law which they will obey is found. In other words, by careful observation it becomes possible to derive an approximate probability. For example, if we observe the manufacture of 140,000 bolts and find that 690 defectives were manufactured, it becomes possible to state, based on observation alone, that the probability of a defective bolt being manufactured is

$$P = \frac{690}{140{,}000} = 0.00492$$

If we have a large number of trials n in which an event E occurs m times, then, unless there is good reason to hold otherwise, the customary assumption is that m/n is a satisfactory estimate of the probability of the occurrence of E in a single trial. The larger n is, the more sure we may be of the estimate.

Probability Based on Analysis

An analysis of the ways an event E can occur in n trials, gives rise to an immediate evaluation of the probability of its occurring in any one trial. Suppose we had 100 screws, of which 30 were defective. If we consider all the different screws which could be taken as samples (under the condition that after they were inspected they were returned to the lot of 100) then the probability of any one of the 30 defectives being picked is 30/100 or 0.3. This analysis is true if the selection of the screws is truly random, i.e., any screw is as likely to be selected as any other.

Expected Occurrence

Suppose the probability of occurrence of a defective bolt is 0.00492, as shown above. What is the expected number of defective bolts which will show up in the next production run of 27,950 bolts? Let x be the expected number. Then:

$$\frac{492}{100{,}000} = \frac{x}{27{,}950}$$

$$x = 27{,}950 \times 0.00492 = 132$$

That is, the expected number of occurrences of an event E in a number of trials n (when the probability of its occurrence at all is p) is pn.

Fraction Defective

"Fraction defective" refers to ratio of the failures to the total number tested. "Fraction defective is the fraction of the total number of units under consideration that fail to conform with a specified requirement for a unit."[2]

As an example, if we found five bad pencils in a sample of 300 taken from a lot of 10,000, the fraction defective is 5/300 or 0.016.

Certainty and Impossibility

If we have a deck of 52 cards and we wish to compute the probability of making a random selection of the ace of spades, we divide the number of ways the event can occur as a success by the total number of ways it can occur at all, i.e., the probability of making this selection is

$$p = \frac{1}{52} = 0.0192$$

If the deck had its ace of spades removed and replaced by a joker, the probability of selecting the ace of spades would be

$$p = \frac{0}{52} = 0$$

Under this condition it would be an impossibility to select an ace of spades. Hence: An event is an impossibility if the probability of its occurrence is zero.

Likewise, if the 52 cards in the deck were all aces of spades, the probability of selecting the ace of spades would be :

$$p = \frac{52}{52} = 1$$

i.e., it would be impossible NOT to draw an ace of spades.

A certainty then is an event which has a probability of occurrence of

$$p = 1$$

The probability of occurrence of an event rests between an impossibility and certainty, i.e.:

$$0 \leqslant P \leqslant 1$$

Probability is the likelihood of an event happening.

Definition of Probability

The definition of probability, or perhaps what may be considered as its basic theorem, can be stated as:

If, under fixed conditions, a group n, of mutually exclusive events, all equally likely, can occur and m of these events are favorable to an event E, then the mathematical probability of the success of E occurring is:

$$p_e = \frac{m}{n}$$

provided the event occurs at all.

The term "mutually exclusive" means that if one event occurs, none of the others can occur.

As an example of the use of the definition, consider the situation of 100 screws presented above. In that case, the probability of selecting a defective screw on a single trial was:

$$p = \frac{m}{n} = \frac{30}{100} = 0.3$$

Total Probability

If the occurrence of any one of a set of mutually exclusive events is considered a success, the probability of the occurrence of a success is equal to the sum of the probabilities of success for the individual events. *Proof:* Suppose that the expected number of occurrences of Z events in n trials is

$$np_1 + np_2 + np_3 + \text{——} + np_z = n(p_1 + p_2 + p_3 + \text{——} + p_z)$$

Since

$$\frac{np}{n} = p_{total} \text{ then}$$

$$\frac{n\,(p_1 + p_2 + p_3 \text{——} p_z)}{n} = p$$

$$p_1 + p_2 + p_3 + \text{——} p_z = p_{total}$$

Use of Total Probability

A worker advises her foreman in a food-canning factory that 20 defective containers have disappeared. The worker suggests that they might be in the stock of 1000 piled upon the floor. The foreman decides to check the stock. After examining two cans and finding them perfect, he decides that the defectives are not in the stock. Was he justified?

Answer: Assuming the 20 defective cans to be among the 1000, the probability of finding a defect on the first trial was

$$p_1 = \frac{20}{1000} = 0.02$$

As the first can was perfect, the probability of finding a defect on the second draw was

$$p_2 = \frac{20}{999} = 20(0.001001) = 0.02002$$

p_t

The total probability of finding a defective on either the first or second trial is

$$p_t = p_1 + p_2 = 0.02 + 0.02002 = 0.04002$$

The foreman definitely was not justified in deciding the defectives were not in the stock.

Compound Probability

If the occurrence of a set of events is considered a success, then the probability of the occurrence of a success is equal to the product of the probabilities of the individual events. *Proof:* Let E_1 = Event 1, and E_2 = Event 2. The expected number of occurrences of E_1 is np_1, where n is the number of trials. Of this expectation, the expected number of occurrences of E_2 is $p_2\ (np_1) = np_1p_2$. This logic can be advanced to show that the expected number of occurrences of all of z events is $n(p_1\ p_2\ p_3\ \ldots\ p_z)$

But since

$$p = \frac{np}{n}, \text{ then}$$

$$p = \frac{n(p_1\ p_2\ p_3\ \ldots\ p_z)}{n}$$

$$= p_1\ p_2\ p_3\ \ldots\ p_z$$

Computation of Compound Probability

In the example given above, the probability of the foreman selecting consecutively 5 of the 20 defective cans in the grand lot of 1000 was:

$$p_t = \frac{20}{1000} \times \frac{0.19}{999} \times \frac{0.18}{998} \times \frac{0.17}{997} \times \frac{0.16}{996}$$

$$= 0.000000001867$$

$$= 18.67 \times 10^{-10}$$

i.e., a virtual impossibility.

Summary

Three of the most important concepts about probability are:

1. If under fixed conditions a group n of mutually exclusive events, all equally likely, can occur and the occurrence of m of these constitute a success, then the probability of the occurrence of a success is

$$p = \frac{m}{n}$$

providing the event occurs at all.

2. If an event can occur in a number of mutually exclusive forms any one of which is considered a success, then the total probability of p_t of a success occurring is the sum of the probabilities of success of each of the events, i.e.:

$$p_t = p_1 + p_2 + p_3 + \ldots + p_z$$

3. If the occurrence of a set of events (either dependent or independent) is considered a success, then the compound probability of the occurrence of a success is equal to the product of the probabilities of the individual events, i.e.:

$$p_t = p_1\ p_2\ p_3\ \ldots\ p_z$$

[1] "Engineers Manual of Statistical Methods," Leslie Simon, page 19 and charts, John Wiley & Sons, New York.

[2] "Guide for Quality Control and Control Chart Methods of Analyzing Data," American Standards Association Publication Z1.1—1941, 1.2—1941, 29 West 39th St., New York.

Thin Stock Demands Special Die Design

Dies for stock under 0.020-in. thickness differ in construction details from thick-metal dies. These reference drawings provide a handy guide for die designers

BY WALLACE C. MILLS, ROCKFORD, ILLINOIS

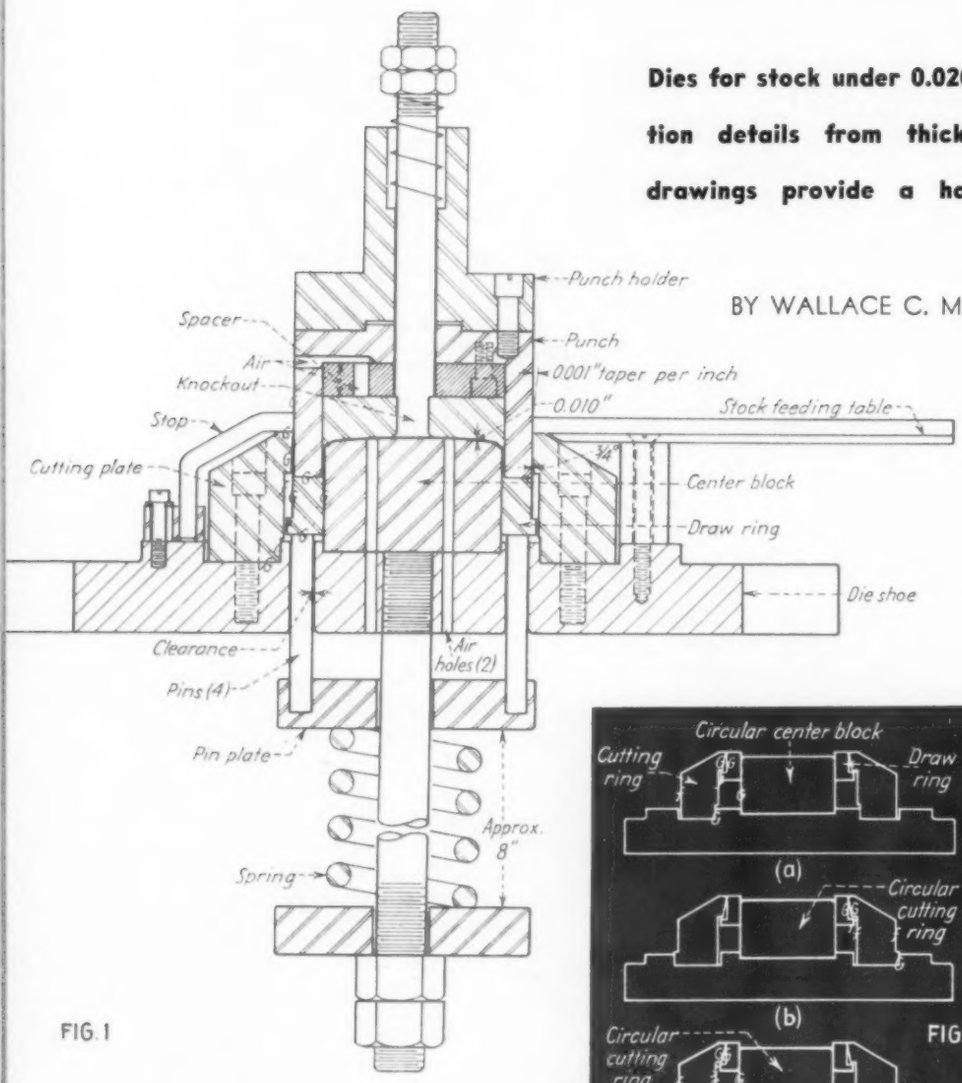


FIG. 1

Fig. 1—This die shows many construction details recommended for thin-metal dies: (1) no clearance between the punch and cutting ring, (2) a knockout spacer to insure bottoming, (3) ground surfaces to maintain alignment and (4) shims to raise cutting ring when it is ground low

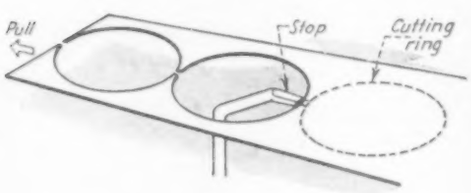


Fig. 2—Pull-through stock feeding saves material, as no web is left between the blanks and no die stripper is needed

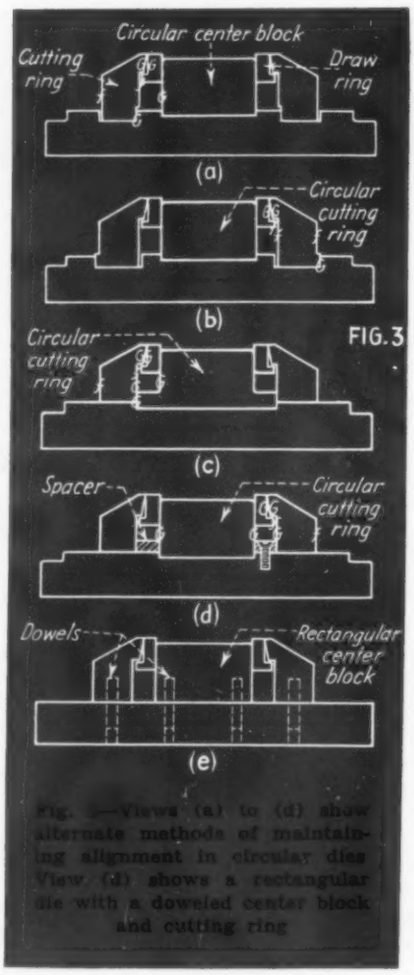


FIG. 3

Fig. 3—Views (a) to (d) show alternate methods of maintaining alignment in circular dies. View (d) shows a rectangular die with a doweled center block and cutting ring

DESIGN of dies for blanking, drawing and perforating thin metal, under 0.020 in. in thickness, is similar in many respects to the design of dies for thicker stock. But, in other respects—clearance, die hardness and certain construction details—die designs may vary.

In analyzing designs that have proved successful in the production of thin-metal shells, it will be found that they differ, depending on the size and shape of the stamping, and that alternative designs may be equally successful. Because of the many possible modifications, it is sometimes difficult to decide which may be the best practice for a given case.

The task is made easier by reference to standard drawings. In the preparation of the drawings shown here, special attention has been given to details of construction that are not always specified on drawings and that cause trouble when overlooked by the toolmaker. These points will be explained in connection with Fig. 1, but are equally applicable to the other designs.

Fig. 1 shows a die for blanking and drawing a simple, 0.010-in. thick shell, such as a can cover. In the design of such a die for thin metal, particular attention should be given to the details:

1. A plain die set without liner pins is preferred for a round die, because the stampings, when blown out of the die, may strike the pins and interfere with rapid production. Also, a plain die set is less expensive than a liner-pin set. If the work is square or has irregular perforations, however, a liner-pin die set is preferred to facilitate setting up of the die in the punch press.

2. The punch and cutting ring of the die should fit without clearance to

insure a clean cut of thin metal. The punch is turned and ground to the same diameter as the cutting ring, then peened and forced through the die. The cutting ring is made of oil-hardening steel, hardened to 62 Rockwell C. The punch is made of water-hardening steel hardened to 42 Rockwell C to permit peening.

To allow for wear, the punch is made as long as possible. For metal thicker than 0.020 in., clearance would have been allowed equal to a tenth the thickness of the stock, and both cutting ring and punch would have been hardened.

3. The cutting ring has ¾° taper clearance which may run clear to the top of the cutting ring. The punch is tapered back smaller at the top by 0.001 in. per inch to avoid scoring.

4. No stripper has been provided on this die for stripping the stock from the punch, because there is a gain in production and a saving in stock by running "pull through" as shown in Fig. 2. The stock is pulled by hand against a stop set flush with the edge of the cutting die. The stock breaks through between the blanks, and the strip spreads open while it is being pulled through.

5. Round dies are provided with devices for maintaining concentric alignment of their respective parts to avoid pinching the stock. Certain surfaces are ground and set against concentrically turned surfaces, and offsets are provided to maintain alignment when the cutting ring is raised by shims because of wear and grinding. Square dies are provided with dowel pins only for maintaining alignment instead of concentric surfaces, because squared dies are more difficult to machine.

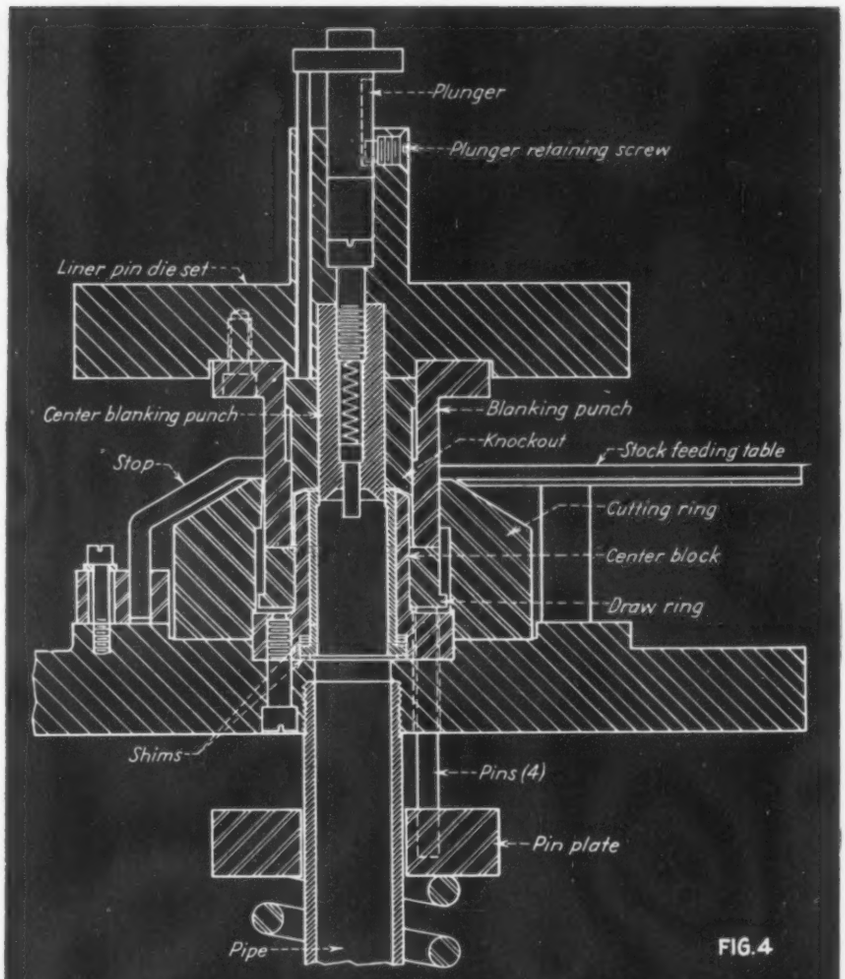


Fig. 4—This die combines center blanking with blanking and drawing. The stock is blanked and drawn to shape before the center punch cuts to avoid distortion of the center hole

Devices for maintaining concentricity in round dies and the surfaces that must be ground and those that need not be ground are shown in Fig. 3 (a)-(d). Fig. 3(e) shows a rectangular die fastened with dowels.

Other details of construction in Fig. 1 which should not be overlooked are:

6. The die should be built with the top of the cutting ring and the draw ring ⅛ in. above the top surface of the center block to allow for initial wear and grinding. When the cutting ring has worn down to the level of the center block, it can then be shimmed up, the alignment being maintained by the offsets.

7. For stampings having panelled tops, the knockout should strike a solid bottom in the punch so the stamping is hit hard between the knockout and the center block. A spacer, provided between the punch and the knockout, can be ground thinner when the punch is ground shorter in sharpening. Otherwise, the punch would not enter the die deeply enough to draw the stamping to full depth. For stampings having a flat top surface without a panel, the knockout need not bottom.

8. A spring in the punch holder should counteract the weight of the knockout so the punch will pick up the work more readily. Exception to this rule is made in dies like Fig. 7 for perforating small holes. In this case the knockout should not be held up, because it cannot then support the slender perforating punches close to the die.

9. Two air holes should be provided in the center block of the die. Only one air hole, off center, might cause the work to tilt when it is lifted from the center block.

10. At least one dowel pin should be provided for round parts that are ground and fitted into a recess. When there is no recess, two pins are required.

11. The corner drawing radius of the punch must be found by trial. Too sharp a radius will tear stock, whereas too large a radius will cause wrinkling. The inside surface of the punch should be ground by starting with an inside diameter 0.002 in. larger than the diameter of the center block plus two thicknesses of stock. The diameter of the punch can then be enlarged as needed. The flat drawing surface of the punch and the top of the draw ring should be lapped.

12. Use of screws extending downwards from the cutting ring to the die holder permits removal of the cutting ring for sharpening without removing the die from the punch

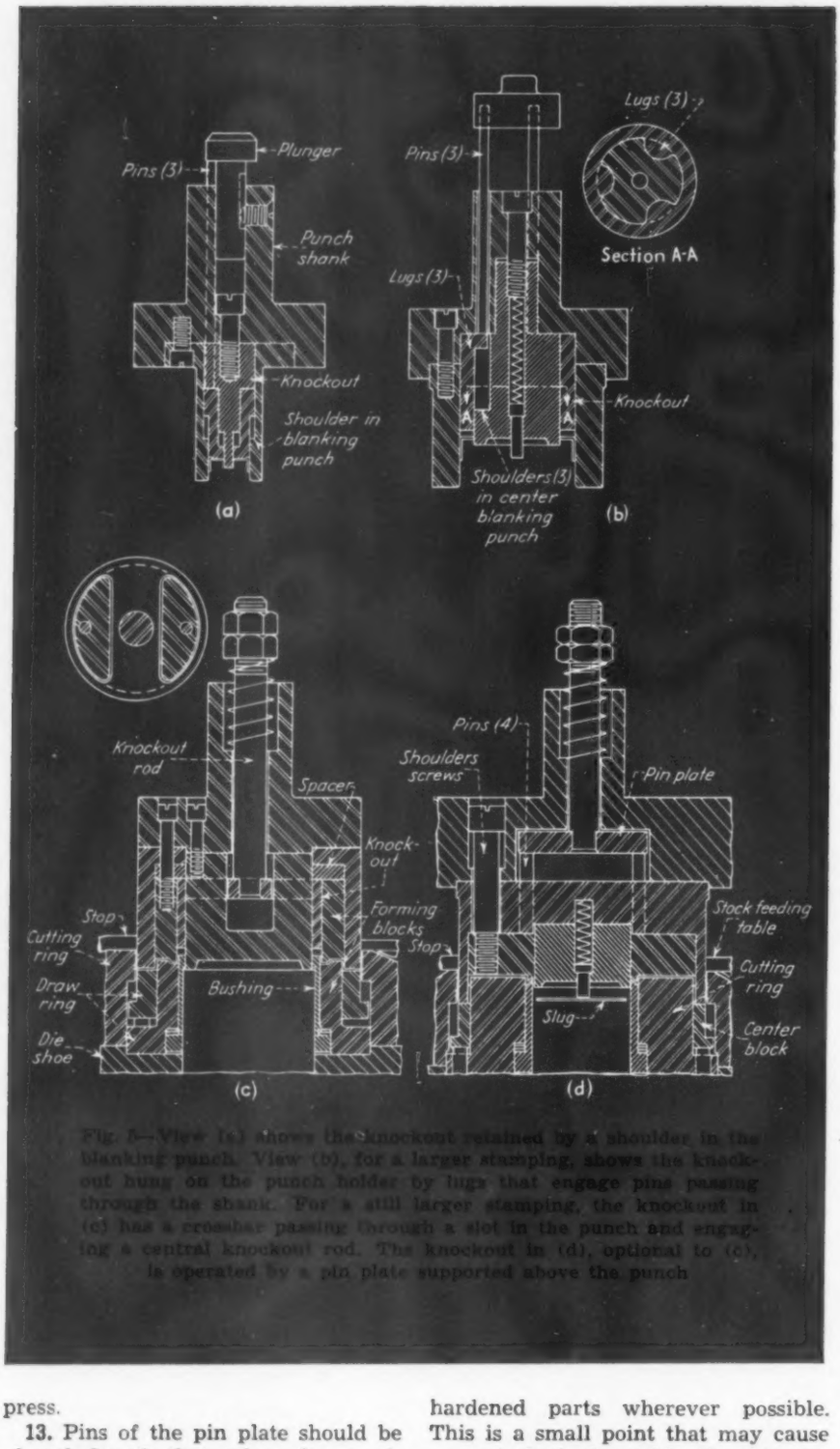


Fig. 5—View (a) shows the knockout retained by a shoulder in the blanking punch. View (b), for a larger stamping, shows the knockout hung on the punch holder by lugs that engage pins passing through the shank. For a still larger stamping, the knockout in (c) has a crossbar passing through a slot in the punch and engaging a central knockout rod. The knockout in (d), optional to (c), is operated by a pin plate supported above the punch

press.

13. Pins of the pin plate should be of such length that, when the punch is up, the pin plate strikes the bottom of the die to relieve pressure on the screws that hold the cutting ring to the die shoe. The holes through the die shoe should be 1/64 in. larger than the pins to avoid any binding action, and should be countersunk to remove burrs formed by drilling.

14. Drawings should show corner radii instead of sharp corners on hardened parts wherever possible. This is a small point that may cause a great deal of trouble if neglected.

15. The screws should not be smaller than 5/16 in. in diameter wherever possible because ¼-in. screws are too small at the thread root.

Fig. 4 illustrates a die for center blanking combined with blanking and drawing. On such a die, the center blanking punch should not cut until the stamping has been drawn to its full depth. Otherwise, pulling of the

SPECIAL DIES FOR THIN STOCK

stock while center blanking will enlarge the hole. The center punch should be provided with a spring pin for pushing the slug through the die.

The bushing, which is the center blanking die, should be provided with shims which may be removed and built up under the bushing to raise it when it is shortened by sharpening. The bushing is given a ½° taper and hardened. The center blanking punch, however, is made semi-hard and forced through the bushing to eliminate clearance.

As the center blanking punch of this die is located in the middle directly under the punch shank, it is difficult to arrange the knockout to operate from the pins in the shank of the punch. The construction may vary, depending on whether the center blanking punch is smaller or larger than the diameter of the shank. Various modifications are shown in Fig. 5.

If flanging at the central hole is combined with blanking, drawing and center blanking, construction of the tools may be made as shown in Fig. 5(c) for flanging upwards and in Fig. 5(d) for flanging downwards.

Fig. 6 shows a die for blanking, drawing and forming a deep panel. This die and the center blanking dies differ in the substitution of the panel-drawing parts for the center blanking punch and die.

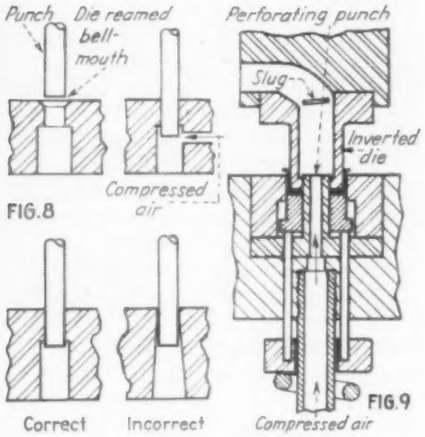


Fig. 8—Slugs may be stripped by sharp shoulders on counterbored holes, or blown off the punches with compressed air. For stock about 0.020 in., bell-mouthed holes cut larger slugs and push them through restricted openings

Fig. 9—With the punch and die inverted, the slug can be blown out of the die by compressed air

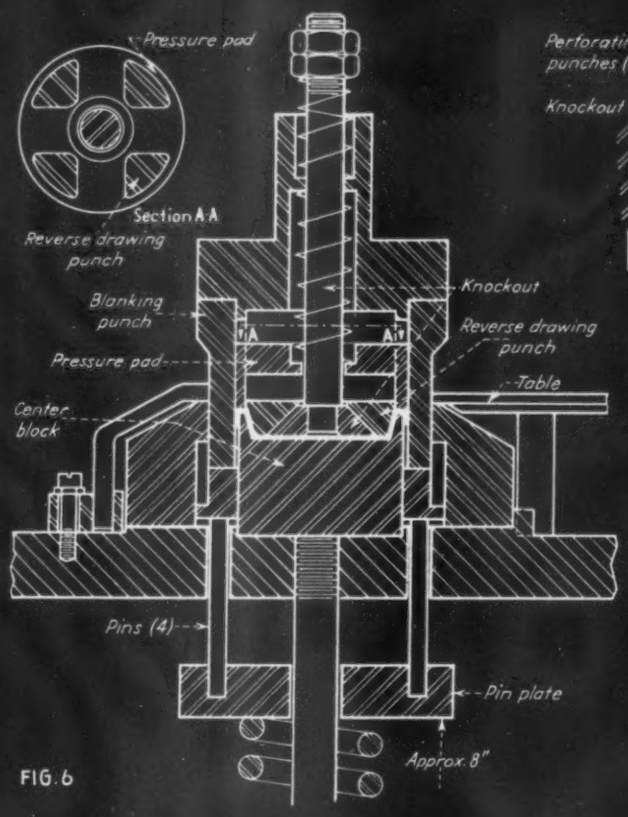


FIG. 6

Fig. 6—The pressure pad on this blanking, drawing and reverse drawing die has a spider-type suspension. Other ways of hanging the pad are used, depending on the size of part

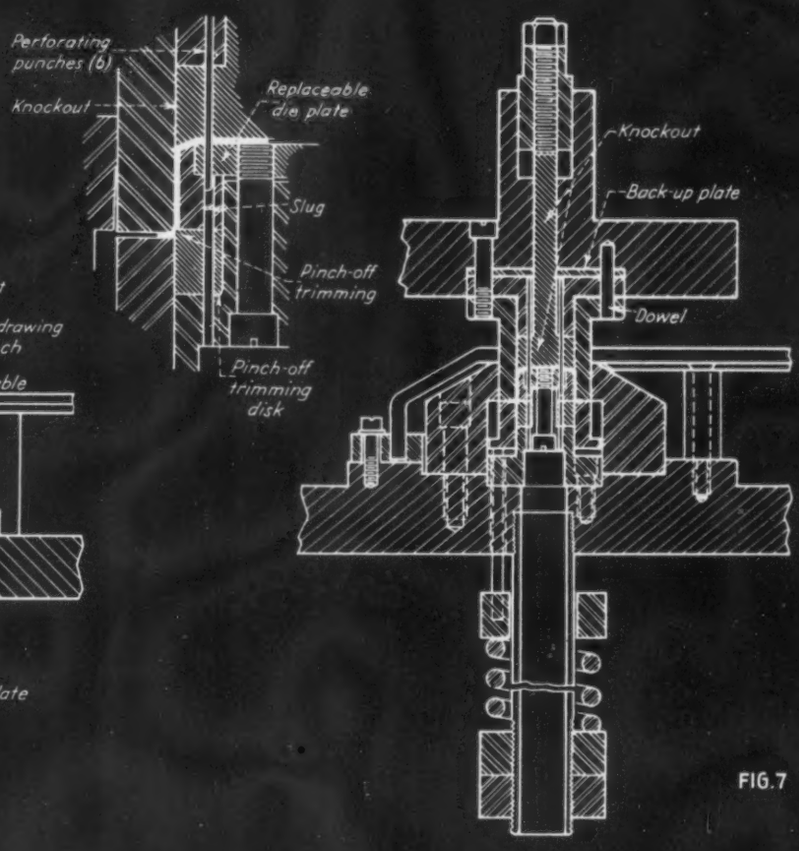


FIG. 7

Fig. 7—This blanking, drawing, perforating and trimming die is for a can closure with sifter holes. The perforating punches should be made as short as possible without making the knockout so thin it causes excessive wear on punches

The details for hanging the pressure pad in the punch are the same as they would be for the knockouts in Figs. 4 and 5, depending on whether the stamping is larger or smaller than the punch shank. The spider form of suspension is used in Fig. 6. To relieve tension on the stock, drawing of the outside of the shell with such a die should be complete before the panel is drawn.

Fig. 7 illustrates a die for blanking, drawing and perforating several small holes, and for pinch-off trimming die, the punch and trimming disk must be hard, while the outside cutting ring, or die, is semi-hard. The trimming disk is centered by offsets on the center block and is ground on both top and bottom so it may be turned over when it becomes dull.

For a perforating die, replaceable plates, or die bushings, are desirable because the cutting edges of small holes become chipped easily. The perforating punches, which are made of drill rod, should be set into sockets that will hold them securely. But the sockets should not be too deep, because deep holes cannot easily be drilled without having the drill run out of true.

Several small punches may be set into a common holding block, or each punch may have a separate integral foot. Very small punches should be set into quills. However small perforating punches may be held, they should be backed up by a hardened steel plate.

In a perforating die the slugs are apt to come up with the punches instead of being pushed through the die. This trouble may be avoided in several ways. In Fig. 7 the punches enter the die deeply and the ends of the punches are domed to form a concave slug that will expand in the die. Other designs are shown in Fig. 8.

Because slugs stick to the ends of punches and are drawn out of the die by suction, it makes little difference whether they are punched upwards or downwards through the die. Gravity has little effect. Upward perforating is practical with the arrangement illustrated in Fig. 9, whereby compressed air passes through the center of the punch and blows the slug up until it strikes an inclined surface and is deflected out of the die.

In addition to the designs here shown, there are other problems occurring less frequently which are not illustrated. Among these are dies that require double-pin plates, one of which is for a pressure pad and the other for ejecting the work. Also, there are double-draw rings as for drawing a flanged shell and forming the flange at the same time, and dies for blanking and drawing a shallow hat-shaped flanged shell, so shallow that it must be picked up by a vacuum cup within the punch. The drawings shown here are the designs occurring most frequently for combination dies for blanking, drawing, center blanking, reverse drawing, perforating and trimming thin-metal shells.

Selective Reduction of Harmful Noise

BY JOHN S. MILLER, JR.

INDUSTRIAL DEPT., MINE SAFETY APPLIANCES COMPANY

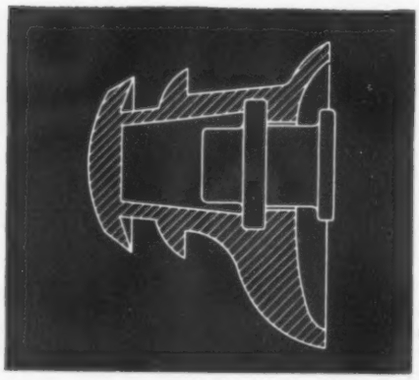
TO GUARANTEE the efficiency and hearing of industrial employees, machines are being designed to operate more quietly and noisy machines and operations are being isolated and insulated. Despite this, operators of offending machines are still subject to the harmful effects of high-intensity noise. Their protection can only be insured by individual treatment.

It is known that sound levels above 75 decibels (unit of measure for intensity level of sound) are fatiguing and may cause transient deafness, while those above 90 decibels are definitely injurious. Exposure of the average employee is determined by his hearing range, which is from the threshold of audibility to about 130 decibels.

General methods for reducing or eliminating unwanted sound are:

1. Insulate the noise source by vibration mountings.
2. Enclose the noise source to prevent the spread of air-borne sound.
3. Absorb air-borne noise acoustically.

Insulation of vibrating machines is possible by supporting or suspending them on resilient mountings of cork, felt, rubber or springs. Proper maintenance; prompt replacement of worn bearings, gears and wheels; scheduled lubrication and leather-belt dressing are other requirements for quiet operation of machinery.



The tapered rubber tube of this ear plug has two barriers, an outer of metal and an inner of soft rubber, separated by an air space. These reduce to a fraction the transmitted volume of air-borne sounds

Physical insulation of noisy machinery and machine parts will diminish effects of intense air-borne noise. Two plaster-board walls with air spaces or sound insulation materials provide effective insulation and prevent the noise from spreading. Hermetically sealed enclosures give the most complete insulation.

In spite of acoustic wall and booth treatment, the noise-producing worker has no protection between himself and the source of noise. He and similar workers throughout the plant benefit little from sound insulation and isolation.

Ear plugs of absorbent cotton, cotton and wax and sponge rubber have been used for individual protection, but have not reduced the sound level sufficiently. An effective ear plug must close the canal with an airtight seal, and should reduce sound level in noisy locations by 35 to 40 decibels.

Professor Knudsen and his associates at the University of California, knowing that rigid materials were unsuitable, designed a protective device made from neoprene with a central metal insert. Since the war a special elastomeric material has been developed which is suitable for ear plugs, is non-toxic, soft and pliable, resistant to ear wax and may be tinted to match the skin. Such devices selectively eliminate harmful high-frequency noises. Insertion must be careful for maximum benefit.

COMPARATIVE SOUND RATINGS

Decibels	Noise
10	Rustle of leaves
20	Average whisper 4 ft. away
40	Soft music
50	Restaurant clatter, vacuum cleaner, average office
60	Busy streets, noisy offices or department store
70	Stenographic room, average motor truck
80	New York subway
90	Pneumatic drill
100	Auto horn, riveting machine
110	Express train at high speed
120	Threshold of feeling (varies with frequency)
130	Threshold of painful sound, limit of ear's endurance

MACHINE NOISE RATINGS

Decibels	Machine
95 to 105	Punch press
100 to 105	Drop hammer
100	Bumping Hammer
130	Hydraulic Press
95 to 100	Automatic Riveter
Up to 100	Grinding Machine
80 to 90	Lathe
90 to 100	Automatic Screw Machine
95 to 110	Wood Planer
Up to 110	Wood Saw

Hard Carbides Find Non-Cutting Uses

By PHILIP M. McKENNA, PRESIDENT, KENNAMETAL, INC.

WHEN a fundamentally new material becomes available for construction of tools and machine parts, the shop man, engineer and inventor too often look upon it as a substitute for older, more familiar, materials. For example, "tool steel" was first used for cutting tools, but when the effects of heat-treatment became well known the field of applications broadened. Thereupon, the greater resistance to wear and abrasion of heat-treated tool steels, as compared with ordinary machine steels, were utilized in machine elements to increase accuracy, improve performance and provide greater durability.

And so it is with the cemented hard carbides. For years, the wear resistance and stiffness of these materials were overlooked, except in occasional instances. But now there is an increasing use of these substances in applications where cutting ability may or may not be required. Grinder workrests, gage elements, bearings, bushings, slides, solid boring bars, small wheel spindles, pins for knurling rolls and clamping devices are among current uses.

The underlying reasons why cemented hard carbides are penetrating into the field of mechanical design are evident from the properties cited in the accompanying table. Note, in particular, that the Young's modulus for elasticity is approximately 2.4 to 3 times that of steel. Heat-treatment does not appreciably affect the modulus for steel, but varying the composition of carbides gives the designer considerable latitude in stiffness, so that he can minimize deflection of components and also get other desirable properties. In fact, many persons are surprised to learn that thin strips of carbide are springy and will recover after the load is removed. For example, strips measuring 0.021 x 0.511 in. when subjected to a load at a 4¾ in. overhang, deflected less than steel and resumed straightness when the load was removed.

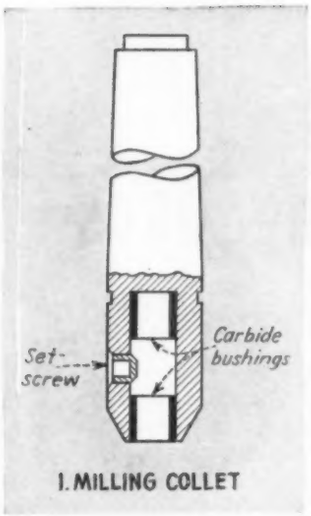
Another characteristic of cemented carbide is its greater hardness, which ranges from 74 to 82.2 Rockwell C, as compared to 66 for hardened high-speed steel. Consequently, the material can be made to "bite" into hard steel, and this feature is taken advantage of in gripping devices.

The non-galling properties of the carbides adapt these materials to applications where heavy frictional loads are involved. The allied problem of wear resistance is also being successfully solved in numerous ways. Carbide die rings gave phenomenal performance in the drawing of shell cases. Currently, manufacturers of razor blades are reporting no wear on blanking tools after millions of hits and expect that the dies will give more than one billion pieces before scrapping.

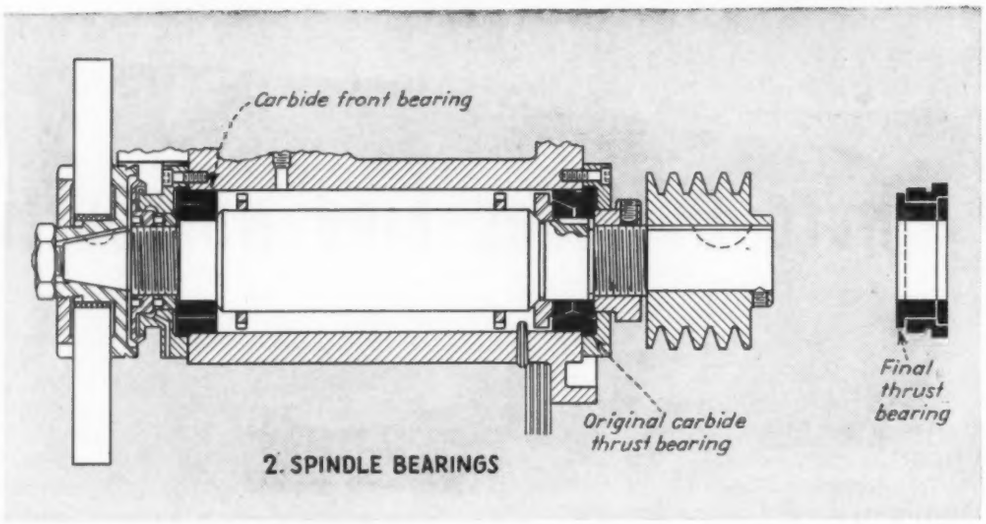
Since cemented carbides are now made in many shapes other than those used in cutting tools, and indeed are available in quite large sizes, the ingenious shop man or designer is no longer restricted in applying them in places where parts fail too quickly or do not have suf-

PHYSICAL PROPERTIES OF CARBIDES AND STEELS

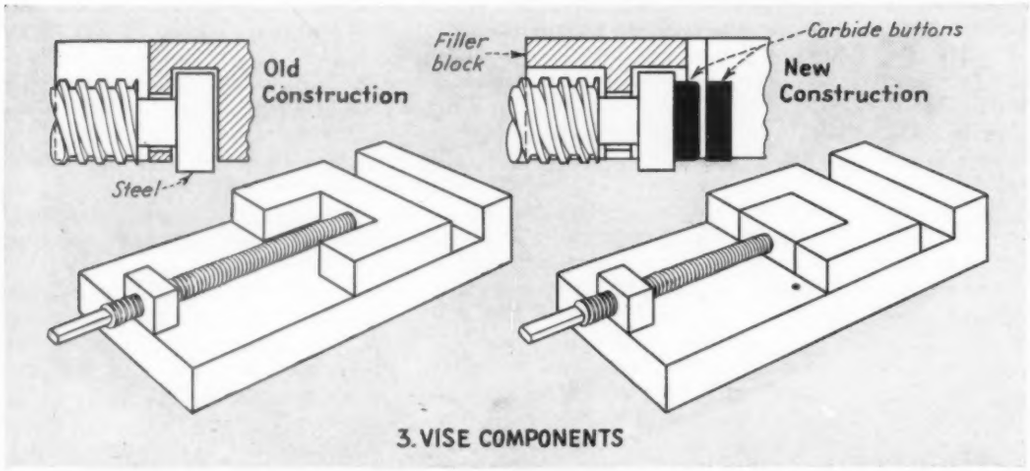
Carbide Grade	Hardness: Rockwell 60 KG. A	Hardness: Rockwell 150 KG. C	Hardness: Vickers 30 KG. Load	Hardness: Knoop 2000 Grams Load	Transverse Rupture Lb./Sq. In. Calc'd Beam	Young's Modulus of Elasticity Musical Pitch	Compressive Strength Lb./Sq. In. Crush Tests	Torsional Strength Lb./Sq. In.	Thermal Expan. X10^{-6} per Deg. C
KM	91.0	77.6	1149	1300	305,000	74,000,000	650,000	125,000	6.0
K3H	92.0	79.6	1238	1460	260,000	72,100,000	675,000	100,000	5.5
K4H	92.2	80.6	1324	1500	225,000	79,600,000	680,000		5.5
K5H	93.1	82.2			225,000				
K2S	91.5	79.0			305,000	80,100,000			
K6	92.2	80.6			225,000	94,300,000			
K12	89.0	74			350,000	77,000,000		186,000	
HSS 18-4-1 (Heat-Treated)	85	66	960			32,500,000	600,000		
1.10%C Steel (Heat-Treated)	85	66	437			29,500,000			
Co.-Cr.-W. Alloys		63-67			160,000				14.4 to 16.9



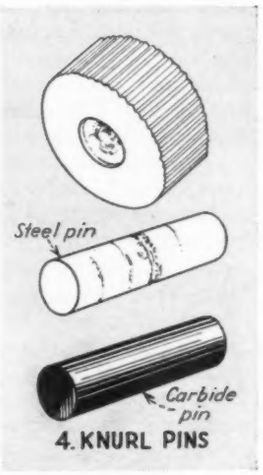
1. MILLING COLLET



2. SPINDLE BEARINGS



3. VISE COMPONENTS



4. KNURL PINS

ficient rigidity. A number of current applications are illustrated to serve as examples where savings can be made in shopwork.

WEAR RESISTANCE

The wear-resistance of carbides in gages, grinder workrests and similar applications is well-known. But this property is now being used advantageously in other ways: namely, for bearings and locating elements of tool-holding devices.

Milling Machine Collets. Internal wear in milling machine collets was so great that collets were replaced every two or three months. The locking setscrew pressed the tool shank against one side of the collet hole, causing localized wear so that the cutter ran eccentrically. To overcome this fault, the collet was bored out and heated. Then two carbide bushings were dropped into the place with a carbon spacing plug between them. (Fig. 1) After the assembly cooled, the carbon plug was broken up with a drill and the I.D. of the carbide bushings was ground to suit the tool shank. After 18 months of hard use, the modified collets showed no signs of wear.

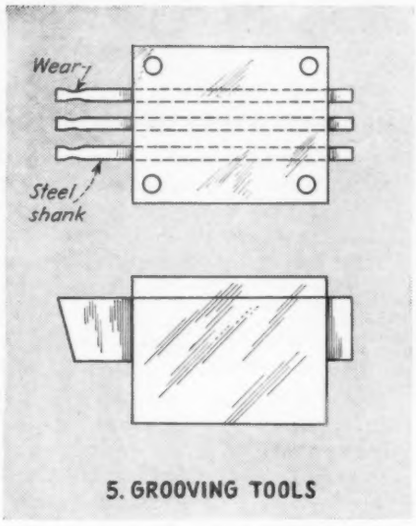
In this instance, the collects were bored out to 0.499 ±0.0001 in., and after heating, the 0.005 in. carbide bushings were inserted. After expansion fitting, the carbide bushings were ground to 0.375 in.

Spindle Bearings. End thrust is a serious problem when diamond grinding holes in carbide dies, bushings and similar pieces. Average life of the bearings in an internal grinding spindle was five weeks. After installation of a three-piece, cone-type bearing made of carbide, (Fig. 2) the machine was used 18 months without perceptible spindle wear. Then, to obtain a cooler running bearing, a three-piece thrust bearing without the cone feature was substituted. The newer-type carbide bearing withstands higher spindle speeds than a ball bearing and heats up less. Net results: operating precision of the machine is constantly uniform, reject losses are reduced, and there is less expense for changing bearings and lost production, arising from shut-downs.

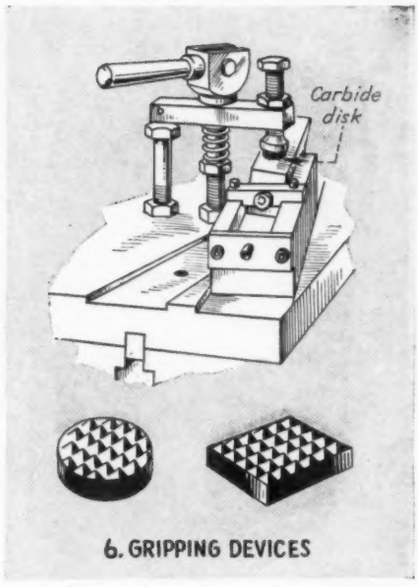
TO RESIST GALLING

Cemented carbides, because of their hardness and ability to take a smooth finish, resist galling and seizure under heavy loads. For these reasons, applications have been made successfully in cases involving both slow and fast rotative speeds.

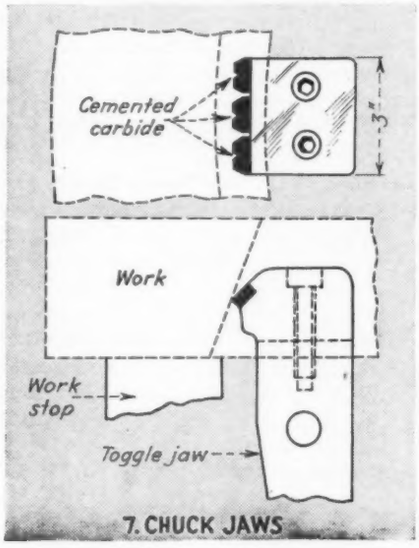
Vise Components. Girl operators could not open machine vises without help. In the original construction (Fig. 3) the movable jaw was actuated by a steel screw with a steel disk on the end seating in a circular slot. Under the heavy pressure developed at tightening, the disk galled the seat in the jaw and extra effort was required for release. These steps were taken to improve the vise:



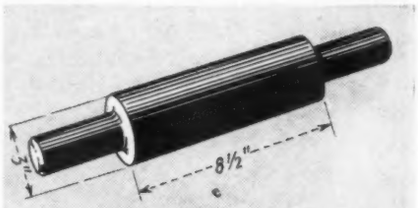
5. GROOVING TOOLS



6. GRIPPING DEVICES



7. CHUCK JAWS



8. STRIP-MILL ROLLS

9. SEAMING ROLLS

1. A carbide disk was brazed to the face of the steel disk on the screw.

2. The slotted portion of the movable jaw was milled out and a plate with a carbide insert was fitted in place.

3. A new jaw-retracting block was made to fit between the wings of the movable jaw and fastened in place.

With these modifications, carbide to carbide contact was established. No galling occurred, the smoothly finished carbide inserts show no wear after four years of service, and the effort to release the vise does not exceed the effort to tighten it.

In addition, two flat strips of carbide were recessed into the bed of the vise to avoid wear at this point and consequent inaccurate seating of workpieces.

Pins for Knurls. Calling and seizure of knurls upon their supporting pins occurred. By substituting carbide pins, (Fig. 4) it was found possible to operate the knurls at higher speeds and feeds, and no further trouble was experienced. The usual clearance between pin and knurl is used.

DEFLECTION RESISTANCE

Overhung tool elements and mandrels respond like a cantilever beam to loads imposed by cutting pressure. Their deflection is *inversely* proportional to the Young's modulus of the material. If the part is made of steel and its cross-section cannot be increased, up to a three-fold gain in stiffness can be secured by making the component of solid carbide.

Grooving Tools. The carbide-tipped steel blades, (Fig. 5) tended to weave while the cut was in progress, causing hollows to wear on the sides of the blade. Then, if reground in the customary manner, the tools would have back relief which was undesirable. To remove the hollows meant cutting off an appreciable section of the blade. Solid carbide blades were substituted, and increased stiffness of the material prevented the weaving action formerly encountered.

Mandrels. For any material used in mandrels or boring bars, there is a definite limit with respect to depth-diameter ratio of holes that can be machined. If deflection is too great when machining deep holes, it has been suggested that carbide be substituted for the steel mandrel, because the gain in stiffness is directly proportional to the Young's modulus of the respective materials. For this reason small boring bars are now made of solid carbide.

GRIPPING DEVICES

Since the crushing strength of the cemented carbides is several times that of machine steels and hardened alloy steels, the sintered product can be applied for a number of gripping purposes. By molding serrations or grooves into the gripping units, it is possible to develop adequate holding power without "biting" deeply into work pieces and marring their surfaces.

Serrated Disks and Squares. Diamond-pattern disks and squares of ½, ⅝, ¾ and 1 in. diameter or width, (Fig. 6) can be brazed to the heel of a clamp, to vise jaws and to other gripping devices. These will bite adequately and easily into hardened steel workpieces but will not mar the surface as greatly as screws.

Chuck Jaws. For a special car-wheel lathe, tool designers elected to use a toggle-actuated, three-jaw chuck, (Fig. 7) that bites into the tapered bore of the forging and pulls it down onto work stops arranged on the table. Each jaw is fitted with three carbide inserts which are grooved so that each insert has two biting surfaces. With this arrangement the O.D. and the top face of the car wheel can be machined at one setting.

CARBIDE ROLLS LAST LONGER

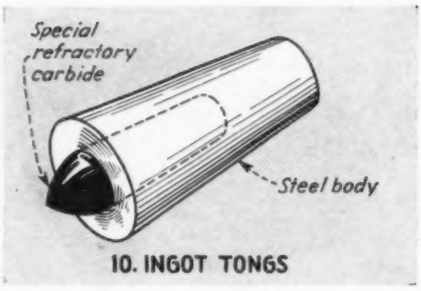
Several properties of the cemented carbides make them suitable for use in roll applications. Hardness, torsional strength, compressive strength, shear strength, high modulus and wear resistance all have a bearing upon selection of material for some rolls.

Strip Mill Rolls. Steel rolls flatten more than carbide rolls at the line

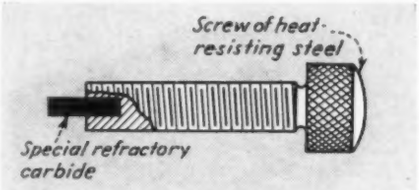
of contact. Therefore, rolls of the latter material, (Fig. 8) take a better "bite" when rolling hard materials like 1.10% carbon steel razor-blade stock, and the desired reduction can be obtained in fewer passes. Being harder than steel, the carbide rolls resist galling and scoring, they will not "pick up" and perhaps cause the strip to wrap around the roll and shut down the mill. And up to 100 times as much material can be rolled before regrinding is necessary. Also, the surface finish on the rolls is reproduced within the strip.

The torsional strength of the proper grade of carbide is great enough so that rolls can be driven through journals instead of by back-up rolls, and a safety factor of 5 can be obtained in their design.

Deflection of rolls is limited by the high Young's modulus of carbide. Hence, straight rolls measuring 2⅜ in. in diameter by 40 in. long are being used to roll 36-in. wide strip to close thickness tolerances over the width of the strip.



10. INGOT TONGS



11. GLASS TONG

Seaming Rolls. During the war, approximately 12,000,000 heavy-gage military oil cans were seamed with a carbide roll, (Fig. 9). Steel rolls were worn after processing 100,000 pieces. The carbide roll was about 3¼ in. in diameter, but larger ones can be made with a steel core.

HEAT-RESISTING APPLICATIONS

The crushing and shear strengths of carbides at elevated temperatures, coupled with wear resistance, enable these materials to out-perform steels when used in various forms of tongs. Special refractory grades of carbide are used.

Tong Bits. Around steel plants and forge shops there is plenty of scrap steel from which to make tong bits, but frequent replacement of them brought a call for cemented-carbide inserts. Cones of special refractory carbide have been inserted in the body of the steel tong bit, so that a longer wearing point could be obtained. These inserts have adequate strength to handle heavy loads, and the points are less subject to wear and deterioration from contact with hot steel ingots or forgings.

Sheet-Handling Tongs. In the glass industry, sheets of plate glass are suspended on a conveyor by tongs and pass through lengthy annealing, soaking and cooling cycles. These tongs are fitted with a number of screws to obtain several points of contact with the glass. To avoid wear, deformation and likelihood that defective tongs will drop the sheet, heat-resisting steel screws have been fitted with nibs of special refractory carbide.

OUR SHOP . . . 7 — *"Precision Shaping Dept. . . ."*

Tapers That Fit

MAKING A GOOD FIT on a long taper, such as a lathe center or the shank of a drill, requires greater accuracy than many realize. Let any one who doubts this study the dimensions of the standard tapers below No. 200. As we all know, the Brown & Sharpe taper was intended to be ½-in. per ft. In reality, none of them are exactly what they were supposed to be.

The Brown & Sharpe taper varies from 0.50200 to 0.59441 in. per ft., and the Morse from 0.60235 to 0.63151 in. per ft. Lack of definite means of accurate measurement was doubtless the cause, as they had good workmen in those days.

To get a really good fit that will bear along its length and insure a good fit, these figures must be followed. The practical way, however, is to have standard taper plugs which can be duplicated more easily than true tapers can be produced by measurement.

ROUND TABLE

Equal Pay for Equal Work?

"That Henry Mack of yours is a crackerjack toolmaker, Ed. He's fixed up the tooling on the universal so I'm getting production. That's about the third job like it he's done in the last six weeks."

"Yes, Al, Henry is a good man—a little too standoffish for my taste, though. I hand him the tough ones that a man can handle alone. He fixes 'em, one after another, no matter how hard they are or how long they take. But he can't keep a helper or get along with an apprentice. If it wasn't for his cussedness, he'd be a foreman long since."

"Another case where a good man is held down by his disposition, eh, Ed? Can't he shake loose and be enough more human so he can get on up the line?"

"Apparently not, Al. I gave him his chance just before the war. No luck. He blew it by getting every man in the place sore, from tool-crib kid to the Big Boss. I had orders to get rid of him —but kept him on for special jobs."

"Is he content with that kind of treatment? I'd think he'd pull stakes and go somewhere else where he'd get a better job. Or do you buy him out of the idea?"

"Nope, Al, he gets the same rate as the other top toolmakers—I don't believe in showing any preference."

"You don't believe in being fair either, do you, Ed? Just because a guy has a sour outlook, you take advantage of him. Here's a guy who takes no watching, makes no mistakes, can handle outside jobs on his own—so you pay him just what you pay the boys you have right where you can watch 'em!"

"I'm as fair as any other sensible foreman, and I'm not taking advantage of Henry. If he hadn't flopped as my assistant, he'd be doing a lot better than he is. There's no sensible excuse for picking him out for favors just because he does a good job."

"That's the best reason in the world for showing favors. He's worth more than the guy who takes more of your time, makes expensive mistakes and otherwise louses things up. He may not be able to boss others, but he seems pretty competent when it comes to bossing himself. That's more than you can say for some of those palookas. You've got to nurse 'em like babes, and watch 'em like a hawk."

"I figure that's part of the complication in my job, Al. If I start paying special wages to one man, I've got to pay 'em to others—and first thing you know I'm up the crick, with everybody wanting extra dough. I'm for lining 'em up, square and fair, and holding the line."

"Still bullheaded, aren't you, Ed? I don't see how you can call it square when you pay a good man and a passable one the same. . . ."

ARE ALL MEN *in a given group worth the same wages? How can you allow for differentials in skill, service, attitude, etc., without setting up a wage competition? Or is such competition good for morale? Your experiences and ideas may clarify this perplexing problem for others. Discussions of earlier topics appear on later pages.*

BASIC RELATIONSHIP OF HYPOID GEARS—8

Design for Duplex Cutting

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Hypoids can be easily machined, especially if they are designed to make use of standard cutters and available cutting equipment

THE PROCEDURE of designing hypoid gears of any ratio, described here, is intended specifically for hypoid gear pairs in which both members are generated and where both sides of a tooth space are simultaneously cut with a face-mill cutter. It can also be applied to gear pairs where opposite tooth sides are separately generated on the pinion and to formate gear pairs.

On hypoid pinions and gears, the hand of the teeth depends on the position of the pinion with respect to the gear. To secure a spiral angle of the pinion greater than the gear spiral angle, the gear pair indicated in Fig. 48 calls for a left-hand pinion and a right-hand gear. The pinion is shown in front of the gear and below the gear center. The same relative position of the pinion and gear exists when the pinion is displaced anywhere around the gear axis from the position shown in full lines, as in the dotted position. In such cases also a left-hand pinion and a right-hand gear are required.

The drive shown in Fig. 49, with the pinion set above the gear center and to the right of the gear, calls for a right-hand pinion and a left-hand gear, also in the pinion position shown in dotted lines.

The teeth extend along pitch cones, as determined in part II of this series dealing with gear pairs of any shaft angle. Only gear pairs with shafts set at right angles will be considered here; their formulas are reproduced near the end of this article in the order in which they are used.

Given are the tooth numbers N', N'', the shaft offset E and the mean gear radius R. Assumed are the diameter increase factor k of the pinion, and tentatively the distance Q, which controls the taper of the pitch cones. To be determined are the gear blanks and their relative position, which involves determining the mean addenda a_p, a_g of the pinion and gear teeth, Fig. 50, the face angles γ_o, Γ_o, the outside diameters D_{po}, D_{go}, the face widths F_p, F, and the distances C_d', C_d'' of the plane of the pinion crown from the gear axis, and of the plane of the gear crown from the pinion axis. The root angles γ_r, Γ_r, the pitch diameters D_p, D_g at the outside, the spiral angles ψ_p, ψ of the teeth, and the limit pressure angle ϕ_o are also of interest.

The pitch cones of hypoid gear pairs and the gear blanks depend upon the spiral angles of the teeth and on the lengthwise tooth curvature. Unlike bevel gears, hypoid gears of a one-to-one tooth ratio, with teeth curved lengthwise, have different diameters and different gear blanks by reason of the different spiral angles on the two members of a gear pair. It is, however, possible to use equal gear blanks on both members of a pair on other ratios, such as tooth ratios of 3:2 and 4:3. An example of such a design of hypoid gears is illustrated in Fig. 51. This hypoid gear pair has 18 and 27 teeth, 1-in. shaft offset, and 3-in. pitch diameter on both members, which also have the same outside diameter and face angle. The pitch angle and the root angle are also equal on both members. Different numbers of teeth were cut in identical blanks, at different spiral angles. On both members, both sides of a tooth space were simultaneously generated using a standard Gleason generator and the same face-mill cutter. The teeth were generated conjugate to a helical member, of which a tooth was described by the rotating cutter, as shown in principle in an earlier issue.

In the procedure of design to be described the gear dimensions are determined so as to permit simultaneous generation of both sides of a tooth space on both members in all cases. Such duplex generation requires a specific depthwise taper of the teeth, similar to the specific depthwise taper required on spiral bevel gears for duplex generation.

In the previously derived formulas (7) to (16), the last two items determined are the limit pressure angle ϕ_o and the radius r'' of lengthwise tooth curvature. $\frac{r''}{\cos \phi_o}$ is the curvature radius, as measured on the limit normal. This radius should be approximately equal to the cutter radius used.

To save cutter cost, standard cutter diameters are provided thus:

GLEASON CUTTERS

1.1	4.5
1.5	6
2	7.5
2.75	9
3.5	12

inches mean diameter.

The diameter increase factor $k = \frac{\cos \psi}{\cos \psi_p}$ controls the spiral angles, and is assumed ordinarily between 1.3 and 1.5. The smaller k is, the smaller will be the spiral angles.

Distance Q ($=K''O$, Fig. 9) may be initially assumed by comparison with other jobs or, if none are at hand, as

$$Q = \tfrac{3}{4}\left(R\frac{N''}{N'} + R_p\right)$$

The radius r'' of lengthwise tooth curvature is then computed from the assumed value of Q, and if $\frac{r''}{\cos \phi_o}$ is within 10% of a standard cutter radius, the figures represent a probable solution. They are a solution if the spiral angles and the limit pressure angle are not excessive, and if the cutter diameter is of a reasonable size.

A large cutter diameter gives more depthwise taper than a small one, which is undesirable if excessive. When the cutter diameter is too small, it is difficult to obtain a long enough tooth bearing. The cutter diameter should preferably be smaller than $4A$ and larger than $.24\ M$. M is computed in equation (32). The limit pressure angle ϕ_o should be numerically smaller than about 16 deg.

When the computed item $\frac{r''}{\cos \phi_o}$ is outside of the range of standard cutter radii, a different distance Q should be assumed, and equations (8) to (16) are then refigured. To increase $\frac{r''}{\cos \phi_o}$

increase Q; and to decrease $\frac{r''}{\cos \varphi_o}$ reduce Q.

If after the second trial the result is still unsatisfactory, the final value of Q may be obtained by interpolation. The third computation then yields a curvature diameter $\frac{2\,r''}{\cos \varphi_o}$ close to one of the standard cutter diameters.*

The working depth of the teeth is taken in proportion to their normal circular pitch, which is equal on both members of a gear pair. At the mean point, the working depth is fixed at 2 M for general work, which compares with a normal circular pitch of πM at this point. This is the same proportion as used on spur gears and bevel gears. When the tooth numbers are large, there is no danger of undercut at the base of the teeth, and tooth addenda which are equal on both members can be used.

Frequently, however, unequal addenda are required to keep away from undercut. The addendum proportions required to avoid undercut can be determined substantially as on spur gears and bevel gears, and need no detailed description. Equivalent tooth numbers N_e', N_e'' are determined and used as a guide for addendum proportions. A factor C_s is computed with equation (33), and the equivalent tooth numbers are determined therewith in formula (34). They are used to obtain the addendum constants C_p, C_g in formula (35), which gives the addenda a_p, a_g of the pinion and gear, the clearance c, and the dedenda b_p, b_g, all at the mean point. The addendum constants add up to 2, when the working depth is assumed as $2M$.

The gears can be classified into three ranges. Range I contains gear pairs of 20° mean pressure angle, whose equivalent tooth numbers are both larger than 32 or equal to 32. Such gears may have equal addenda. $C_p = 1$; $C_g = 1$; and $a_p = a_g = M$.

Range II contains gear pairs, whose sum of the equivalent tooth numbers is either larger than 64 or equal to 64, but where one of the equivalent tooth numbers is smaller than 32. Here also 20° mean pressure angle is used.

$$C_p = \frac{N_e''}{32} \text{ if } N_e'' < 32;\ C_g = 2 - C_p$$

$$C_p = 2 - C_g;\ C_g = \frac{N_e'}{32} \text{ if } N_e' < 32.$$

Range III contains gear pairs whose equivalent tooth numbers add up to a number larger than 40 but smaller than 64. Here a mean pressure angle of 22½° may be used.

$$C_p + C_g = 1.8$$

$$C_p = \frac{1.8\,N_e''}{N_e' + N_e''};\ C_g = \frac{1.8\,N_e'}{N_e' + N_e''}$$

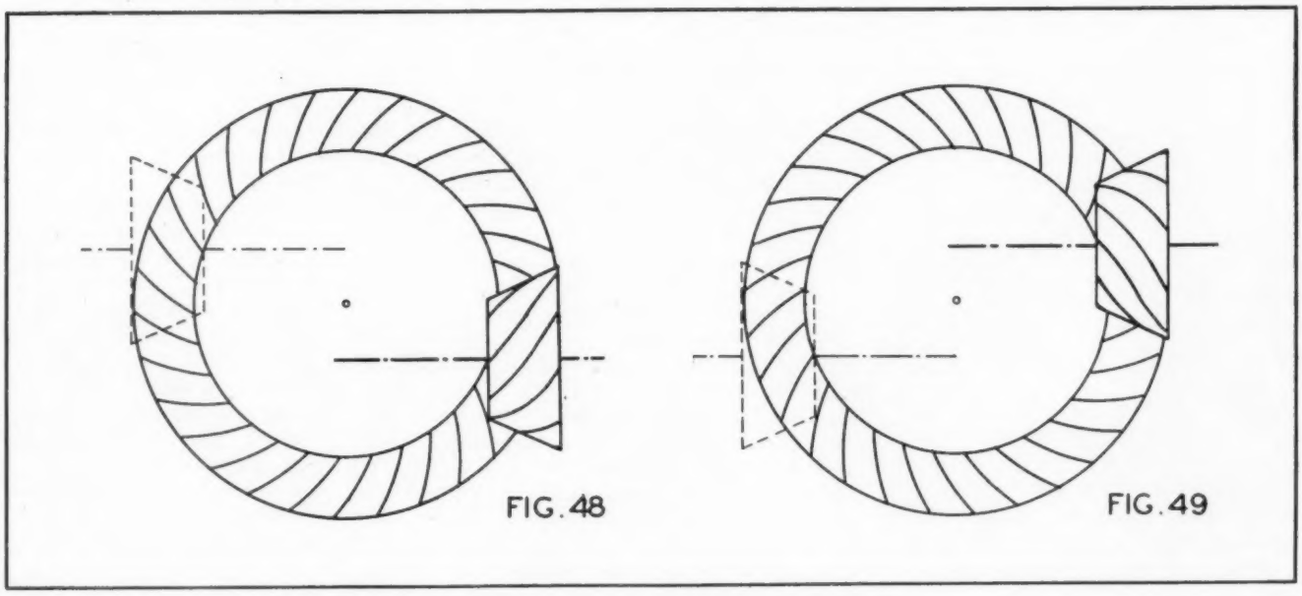
The addendum constants C_p, C_g so determined are based on approximate undercut limits, and represent minimum desirable constants C_p and maximum desirable constants C_g. They apply to generated gear pairs, but not necessarily to formate gear pairs. On automotive ratios of 3:1 and larger, it is customary to use larger constants C_p than above given, and correspondingly smaller constants C_g.

The depthwise tooth taper required for duplex generation of hypoid gears is determined much as on spiral bevel gears, as described in an earlier article. On hypoid gears, however, a basic helical segment is referred to instead of a basic crown gear. Of the infinite number of possible basic helical segments, the one is used whose axis is parallel to the normal plane. This helical segment most nearly corresponds to a crown gear, whose axis also is parallel to the normal plane. ψ_x, equation (38), is the spiral angle of this basic helical segment. Equations (36) and (37) are used to determine this spiral angle. The sum δ_n of the dedendum angles, as measured along a tooth, is given in close approximation by equation (39). Equations (36) to (39) are reproduced here without direct proof, because of the similarity in principle to the corresponding equation on bevel gears.

The sum δ_n of the normal dedendum angles is conveniently divided proportionally to the addenda, as indicated in formula (40) hereafter. The resulting addendum angles are given in formula (41). They are proportional to δ_{ng} and δ_{np}, the proportional factor given in the formula having been determined for infinitesimal angles δ_n, which is found to be sufficiently accurate.

It is recommended that the face width F of the gear be taken as one third of the mean gear cone distance A, as expressed in formula (42). The line of mesh in the pitch plane is found to have a direction projected substantially parallel to the pinion axis, in a view along the gear axis, as in Fig. 50.

* There is also a graphical method and treatment in existence, devised by Allan H. Candee, Gleason Works, which is worth knowing, and which permits making the two initial trials more quickly by working on the drawing board. This may be published later.



Figs. 48 and 49—The hand of the tooth spiral depends on the relative position of the pinion and gear

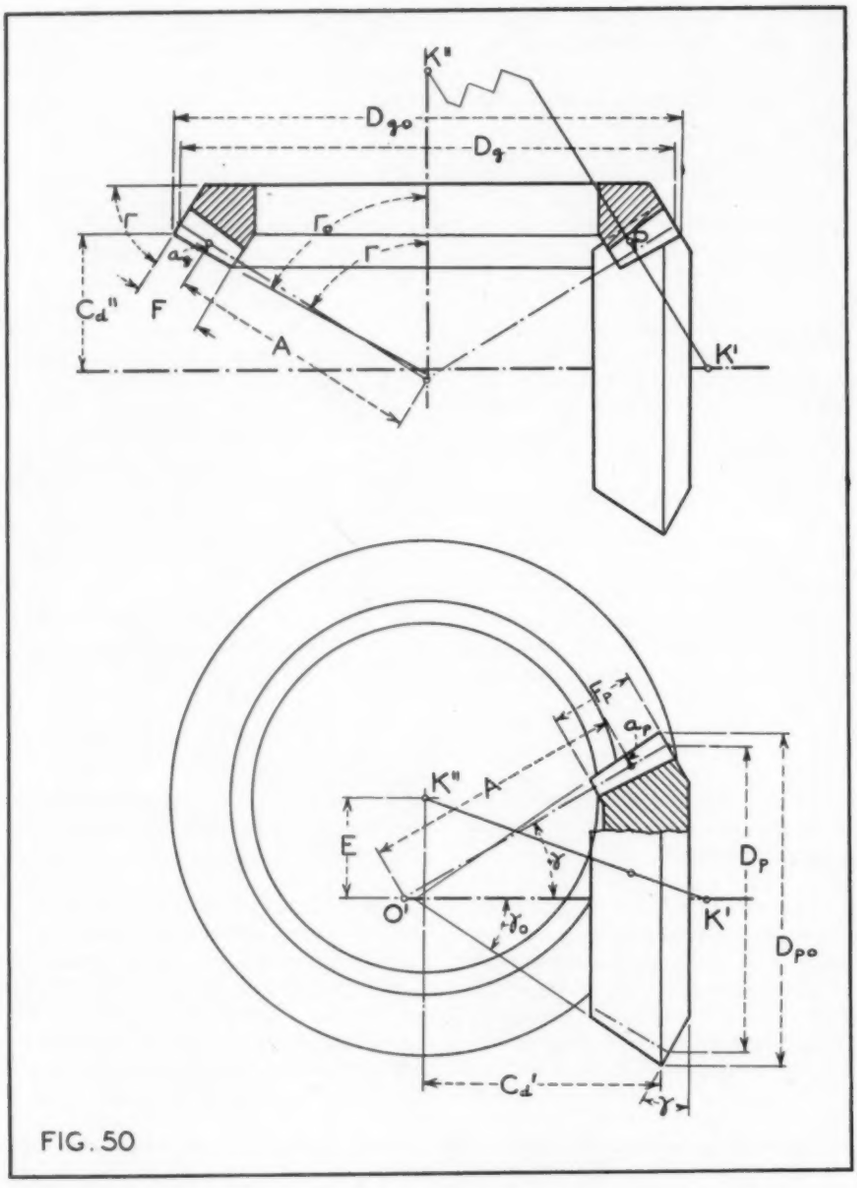


FIG. 50

Fig. 50—Layout diagrams of the computed dimensions and angles

In this view the face widths of the pinion and gear appear as

$$F_p \cos \gamma \text{ and } F \sin \Gamma$$

In formula (42), the first of the two members making up $F_p \cos \gamma$ is derived from said direction of the line of mesh in the pitch plane. The second member represents an overlap of the pinion face over the gear face, based on practice.

The face angles γ_o, Γ_o are obtained by adding the addendum angles to the pitch angles, as shown in equation (43). Equation (44) determines the approximate root angles. The face angles and root angles are measured in the axial planes of the pinion and gear.

Formulas (45) to (48) determine the addenda a_{po}, a_{go} at the outside, the pitch diameters D_p, D_g at the outside, the outside diameters D_{po}, D_{go}, and the crown distances C_d', C_d''. They express simple relationships of plane geometry, and require no special derivations. The quantities are illustrated in Fig. 50. The gear blanks and their relative position are now completely determined.

The described procedure can also be used when the two sides of the pinion teeth are separately cut. The described blank design permits generating by the duplex method whenever desired. Moreover, the computed dedendum angles cause the tooth depth to be tapered in such a way that the width of the tooth bottom is constant all along the teeth on both members of the gear pair. This results in cutters of largest possible point width, which is very desirable.

In automotive hypoid gear design the values given in this and the following paragraph are in current use. Automotive hypoid pinions are generally made formate, when the gear pitch angle is about 70° or larger. A mean pressure angle of 21.25° is widely used for passenger car drives, and 22.50° for truck drives. The conventional pinion spiral angle is 50°, provided that the difference of the pinion and gear spiral angles are at least 15°. In current practice the shaft offset is not larger than one-fifth of the gear diameter (D_g) on passenger car drives, and not larger than one-tenth of the gear diameter on truck drives. The addendum constant C_p currently used on automotive pinions is

1.60 on 5, 6 and 7-tooth pinions; 1.52, 1.66, 1.58, 1.52 on 8, 9, 10 and 11-tooth pinions; 1.44, 1.38, 1.30 on 12, 13 and 14-tooth pinions respectively.

The corresponding addendum constant C_g amounts to 0.20; 0.28, 0.34 0.42, 0.48; and 0.56, 0.62, 0.70, so that the sum ($C_p + C_g$) of the addendum constants amounts to 1.80 on 5, 6, 7 and 8-tooth pinions, and to 2.00 on 9, 10, 11, 12, 13 and 14-tooth pinions.

Special computation sheets are in use for pinion spiral angles of 50°. They are based on a series of graph sheets, devised by the author, and eliminate trials in computing the required pitch angles.

The approach here described is, however, more generally applicable, and moreover furnishes blanks suitable for duplex cutting. Even when formate gears are used, with gear pitch angles of 70° and larger, the blank proportions arrived at with the described method are still usable for duplex cutting.

LIST OF SYMBOLS

N', N''	tooth numbers of pinion and gear
R_p, R	mean pinion radius and mean gear radius
E	shaft offset
Q	assumed distance which controls the taper of the gear blanks. It is the distance of point K'', Fig. 50, from the projected pinion axis
D_p, D_g	pitch diameters at outside
D_{po}, D_{go}	outside diameters of pinion and gear blanks
A_p, A	mean cone distances of the pitch cones, from apex to mean point P
C_d', C_d''	distance of the plane of the crown circle from the axis of the mating members, see Fig. 50
r_c	mean cutter radius
r''	radius of lengthwise tooth curvature

a_p, a_g addenda at mean point P

a_{po}, a_{go} addenda at outside

c bottom clearance

b_p, b_g dedenda at mean point P; $b_p = a_g + c$, $b_g = a_p + c$

k enlargement factor of pinion, as compared with bevel pinion, ordinarily between 1.3 and 1.5

F_p, F face width

γ, Γ pitch angles of pinion and gear

α_p, α_g addendum angles

γ_o, Γ_o face angles

γ_r, Γ_r root angles

ψ_p, ψ spiral angles of pinion and gear at mean point P

ϕ_a average or mean pressure angle

ϕ_o limit pressure angle

$\varepsilon' = \psi_p - \psi$, difference of spiral angles

ε angle $O'K'K''$ as seen in Fig. 50

LIST OF FORMULAS

used in the computation of the gear blanks, shaft angle $\Sigma = 90$ deg.

(7) $R_p = \frac{N'}{N''} R k$

(8) $\tan \eta = \frac{E}{Q}$; Q assumed

(9) $\frac{\sin \varepsilon}{E} = \left(\frac{1}{R} 1 - \frac{R_p \cos \eta}{Q}\right)$

Hence $\sin \varepsilon$, ε

(10) $\tan \Gamma = \frac{\sin \varepsilon}{E}\Big) Q$

(11) $\sin \gamma = \cos \varepsilon \cos \Gamma$

(12) $\sin \varepsilon' = \frac{\sin \varepsilon}{\cos \gamma}$

(13) $\tan \psi_p = \frac{k - \cos \varepsilon'}{\sin \varepsilon'}$; $\psi = \psi_p - \varepsilon'$

$A_p = \frac{R_p}{\sin \gamma}$; $A = \frac{R}{\sin \Gamma}$

(15a) $(-\tan \Phi_o) = \frac{A_p \sin \psi_p - A \sin \psi}{A \tan \Gamma + A_p \tan \gamma}$

(16) $r'' \left[(-\tan \Phi_o)\left(\frac{\tan \psi_p}{A_p \tan \gamma} + \frac{\tan \psi}{A \tan \Gamma}\right) + \frac{1}{A_p \cos \psi_p} - \frac{1}{A \cos \psi}\right] = \tan \psi_p - \tan \psi$; Hence r''

(22) $\tan (\psi_p - \lambda) = \frac{A \tan \Gamma \tan \psi_p + A_p \tan \gamma \tan \psi}{A \tan \Gamma + A_p \tan \gamma}$

(32) $M = \frac{2R \cos \psi}{N''}$

(33) $C_n = \left[1 + \tan^2 (\psi_p - \lambda)\right] \frac{2}{M}$

(34) $N_o' = C_n A_p \tan \gamma$; $N_o'' = C_n A \tan \Gamma$

Hence C_p, C_g as per instructions

(35) $a_p = C_p M$; $a_g = C_g M$

$c = 0.25 M + 0.002''$

$b_p = a_g + c$; $+ c$

(36) $\tan i' = \cot \Gamma \cos \eta k$

(37) $\frac{\Phi_\Gamma}{\Phi_c} = \cos i' \left[1 + \frac{N'}{N''} \tan i'\right]$

(38) $\tan \psi_x = \frac{\tan \psi + \tan \psi_p \left(\frac{N'}{N''} \tan i'\right)}{\left[1 + \frac{N'}{N''} \tan i'\right]}$

(39) $\frac{\delta_n}{\cos \varphi_o} = \frac{10800'}{N'' \tan \varphi_a} \cdot \left[\frac{\Phi_c}{\Phi_\Gamma} - R \cos \psi \frac{\tan \psi_x}{r_c}\right]$; in minutes

(40) $\delta_{np} = \delta_n \frac{C_g}{C_p + C_g}$; $\delta_{ng} = \delta_n \frac{C_p}{C_p + C_g}$

(41) $\alpha_p = \delta_{ng} \frac{\cos (\psi_p - \psi_x)}{\cos \psi_x}$; $\alpha_g = \delta_{np} \frac{\cos (\psi_x - \psi)}{\cos \psi_x}$

(42) Recommended $F = \frac{A}{3}$

$F_p \cos \gamma = F \frac{\sin \Gamma}{\cos \varepsilon} + 4 M \sin \varepsilon \cdot \left(1 - k \frac{N'}{N''}\right)$

(43) $\gamma_o = \gamma + \alpha_p$; $\Gamma_o = \Gamma + \alpha_g$

(44) $\gamma_r = \gamma - \alpha_p \frac{C_g}{C_p}$; $\Gamma_r = \Gamma - \alpha_g \frac{C_p}{C_g}$

(45) $a_{po} = a_p + \frac{1}{2} F_p \tan \alpha_p$; $a_{go} = a_g + \frac{1}{2} F \tan \alpha_g$

(46) $D_p = 2 R_p + F_p \sin \gamma$; $D_g = 2 R + F \sin \Gamma$

(47) $D_{po} = D_p + 2 a_{po} \cos \gamma$; $D_{go} = D_g + 2 a_{go} \cos \Gamma$

(48) $C_d' = R \cos \varepsilon + \frac{F_p \cos \gamma}{2} - a_{po} \sin \gamma$ $C_d'' = R_p \cos \eta + \frac{F \cos \Gamma}{2} - a_{go} \sin \Gamma$

Four tables contain examples of 2:1, 3:2, 4:3; 1:1 tooth ratio respectively. A large enough shaft offset was assumed in these examples to permit the shafts of the gear pair to pass each other. The hypoid gear pairs of 3:2 and 4:3 tooth ratio listed in the tables were designed with equal blanks on both members of the pair. The other two ratios require different blanks on the two members.

EXAMPLE I

Given are the tooth numbers 14 and 28 of the gear pair, the mean gear radius $R = 1.200$, the shaft offset $E = 0.700$, and the pinion enlargement factor $k = 1.400$. All linear dimensions are in inches.

From (7) $R_p = 0.840$

An initial Q — value is assumed as $Q = \frac{3}{4}\left[R \frac{N''}{N'} + R_p\right] = 2.43$

This value does not give a radius of lengthwise tooth curvature as close to a standard cutter radius as desired. The Q-value finally obtained after trial is

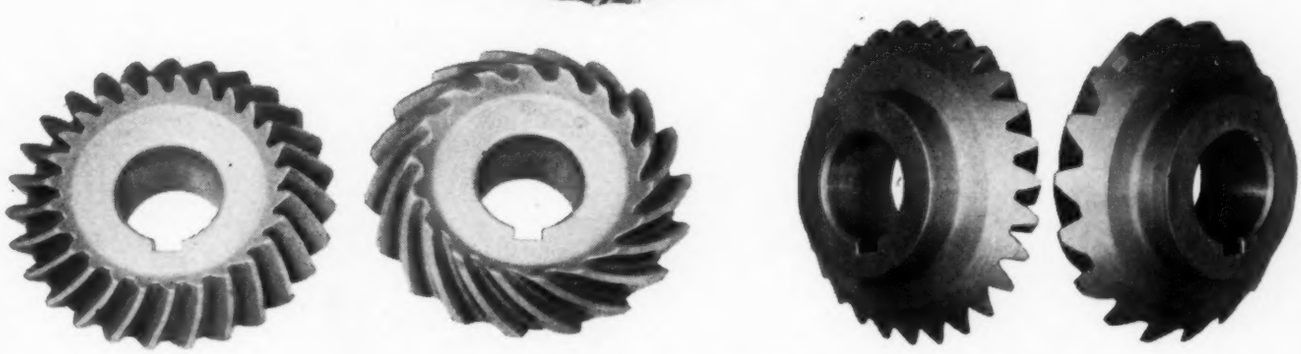


Fig. 51—A pair of hypoid gears with 18 and 27 teeth of different spiral angles cut in identical gear blanks

3 : 2 TOOTH RATIO

Generated Hypoid Gears with equal blank dimensions on both members
20° mean pressure angle

Tooth numbers N', N''	16:24	16:24	18:27	18:27	18:27	20:30	20:30
Pitch diameters $D_p = D_g$	0.843	1.265	1.687	2.250	3.000	3.750	5.000
Shaft offset E	0.300	0.450	0.600	0.750	1.000	1.250	1.500
Face width $F_p = F$	0.179	0.268	0.358	0.469	0.625	0.781	1.000
Pitch angles $\gamma = \Gamma$	42°18′	42°18′	42°18′	42°38′	42°38′	42°38′	43°11′
Face angles $\gamma_o = \Gamma_o$	46°55′	46°55′	46°24′	46°34′	46°34′	46°19′	46°34′
Root angles $\gamma_r = \Gamma_r$	37°41′	37°41′	38°12′	38°42′	38°42′	38°57′	39°48′
Addendum at middle	0.029	0.043	0.051	0.068	0.090	0.101	0.132
Full depth at heel	0.082	0.121	0.143	0.187	0.248	0.281	0.355
Outside diameters $D_{po} = D_{go}$	0.897	1.345	1.782	2.374	3.165	3.937	5.234
Crown distance $C_d' = C_d''$	0.371	0.556	0.747	1.006	1.341	1.686	2.278
Spiral angles ψ_p, ψ	50°10′	50°10′	50°10′	50°53′	50°53′	50°53′	52°34′
	16° 2′	16° 2′	16° 2′	18°53′	18°53′	18°53′	24°20′
Limit pressure angle — ϕ_o	15° 7	15° 7′	15° 7′	13°48′	13°48′	13°48′	11°30′
$R_p = R$	0.361	0.542	0.723	0.962	1.282	1.603	2.174
Q	0.658	0.987	1.315	1.771	2.361	2.951	4.081
$\frac{r''}{\cos \phi_o}$	0.527	0.791	1.054	1.370	1.826	2.283	2.978
Cutter diameter $2\ r_c$	1.100	1.500	2.000	2.750	3.500	4.500	6.000

Linear dimensions in., angles in deg. and minutes

$Q = 2.35$;
numerical results by means of the formulas indicated are as follows:

$\eta = 16.59$ deg. from (8)
$\varepsilon = 22.55$ deg. (9)
$\Gamma = 52.16$ deg. (10)
$\gamma = 34.51$ deg. (11)
$\varepsilon' = 27.74$ deg. (12)
$\psi_p = 47.89$ deg. (13)
$\psi = 20.15°$
$-\phi_o = 10.97°$ (15a)
$r'' = 1.341$ (16)
$\frac{r''}{\cos \phi_o} = 1.366$

$r_c = 1.375, 2.750$ standard cutter diameter, $\tan(\psi_p - \lambda) = 0.8530$ (22)
$N_e' = 43.77$; $N_e'' = 83.99$ (34)
The gears are part of range I, as both equivalent tooth numbers N_e', N_e'' are larger than 32. Hence
$C_p = 1$; $C_g = 1$
$a_p = a_g = 0.080$ (35)
$c = 0.022$
$\tan \psi_x = 0.6202$ (38)
$\delta_a = 459' = 7.65°$ (39)
$\alpha_p = 4.33°$ (41)
$\alpha_g = 4.41°$ (41)
$F_p = 0.571$, $F = 0.507$ (42)

$\gamma_o = 38.84$ deg. $= 38°50'$ (43)
$\Gamma_o = 56.57$ deg. $= 56°34'$ (43)
$a_{po} = 0.102$, $a_{go} = 0.100$ (45)
Whole depth at outside, when $C_p = C_g$
$2\ a_{po} + c = 0.226$, pinion
$2\ a_{go} + c = 0.222$, gear
$D_p = 2.003$, $D_g = 2.800$ (46)
are the pitch diameters at the outside. the outside diameters are computed with (47) as
$D_{po} = 2.172$, $D_{go} = 2.923$
The crown distances are
$C_d' = 1.286$, $C_d'' = 0.881$
The gear blanks and their relative position are completely determined herewith.

EXAMPLE II

Given are the tooth numbers 14 and 28, the pitch diameter of the gear $D_g = 2.800$ at the outside, the shaft offset $E = 0.700$, and the pinion enlargement factor $k = 1.400$.

The mean radius R of the gear is first determined from formulas (42) and (46), thus:

$$2R + \frac{A \sin \Gamma}{3} = D_g$$
$$A \sin \Gamma = R$$
$$R\left(2 + \frac{1}{3}\right) = D_g$$
$$R = \frac{3}{7} D_g$$

Hence $R = 1.200$; and the procedure is the same from here on as in example I.

EXAMPLE III

Given are the tooth numbers 14 and 28, the shaft offset $E = 0.400$, the enlargement factor $k = 1.400$, and the proportion $\frac{R}{E}$, which is the same as

2 : 1 TOOTH RATIO

Generated Hypoid Gears—20° mean pressure angle

Tooth numbers N′, N″	14 : 28		14 : 28		14 : 28		14 : 28		16 : 32		16 : 32		16 : 32	
Pitch diameters D_p, D_g	0.859	1.200	1.145	1.600	1.424	2.000	2.003	2.800	2.416	3.400	3.127	4.400	4.264	6.000
Shaft offset E	0.300		0.400		0.500		0.700		0.850		1.100		1.500	
Face width F_p, F	0.245	0.217	0.326	0.289	0.395	0.350	0.571	0.507	0.673	0.602	0.871	0.779	1.188	1.062
Pitch angles γ, Γ	34°31	52°10	34°31	52°10	33° 8′	53°32	34°31	52°10	33° 8′	53°32	33° 8′	53°32	33° 8′	53°32
Face angles γ_o, Γ_o	38°50	56°34	38°50	56°34	37°32	58° 2′	38°50	56°34	36°59	57°29	36°59	57°29	36°59	57°29
Root angles γ_r, Γ_r	30°12	47°46	30°12	47°46	28°44	49° 2′	30°12	47°46	29°17	49°35	29°17	49°35	29°17	49°35
Addendum at middle	0.034		0.046		0.057		0.080		0.085		0.110		0.150	
Full depth at heel	0.098	0.096	0.130	0.128	0.163	0.160	0.226	0.222	0.241	0.237	0.311	0.306	0.423	0.416
Outside diameters D_{po}, D_{go}	0.931	1.253	1.241	1.670	1.546	2.085	2.172	2.923	2.599	3.527	3.363	4.564	4.586	6.224
Crown distance C_d', C_d''	0.551	0.378	0.735	0.504	0.918	0.626	1.286	0.881	1.567	1.077	2.027	1.393	2.765	1.900
Spiral angles ψ_p, ψ	47°53	20° 9′	47°53	20° 9′	48°0′	20°2′	47°53	20° 9′	48°0′	20°2′	48°0′	20°2′	48°0′	20°2′
Limit pressure angle — ϕ_o	10°58′		10°58′		11°50′		10°58′		11°50′		11°50′		11°50′	
R_p, R	0.360	0.514	0.480	0.686	0.597	0.850	0.840	1.200	1.014	1.445	1.313	1.870	1.790	2.550
Q	1.007		1.343		1.723		2.350		2.930		3.791		5.170	
$\frac{r''}{\cos \phi_o}$	0.585		0.781		1.027		1.366		1.746		2.260		3.082	
Cutter diameter $2\ r_c$	1.100		1.500		2.000		2.750		3.500		4.500		6.000	

in example I. Hence

$$R = 0.686$$

The dimensions obtained in example I may be decreased in the proportion of the shaft offsets, that is in the proportion $\frac{4}{7}$. The value $\frac{r''}{\cos \Phi_o}$ is thereby decreased from 1.366 to 0.781, which is close to the radius of a standard cutter of 1.500 in. diameter. All linear dimensions are similarly decreased, while all angles remain the same as in example I. Thus

$$D_p = 1.145,\ D_g = 1.600$$

Examples I and III are both listed in the table of 2:1 tooth ratio.

EXAMPLE IV

In the table of 3:2 tooth ratio, examples are given with equal blank dimensions on both members of the gear pair. One example is for 18 and 27 teeth, $R_p = R = 1.282$, 1-in. shaft offset. It is desired to check its tabulated values with the described method.

To obtain equal radii R_p, R, the diameter-increase factor k should be equal to the ratio of the tooth numbers.

$$k = 1.500$$
$$R_p = 1.282 \qquad (7)$$
$$Q = 2.361 \text{ per table}$$
$$\eta = \varepsilon = 22.95°, \text{ from (8) and (9)}$$
$$\Gamma = 42.64° \qquad (10)$$
$$\gamma = 42.64° \qquad (11)$$
$$\varepsilon' = 32.01° \qquad (12)$$
$$\psi_p = 50.89° \qquad (13)$$
$$\psi = 18.88°$$
$$-\phi_o = 13.80° \qquad (15a)$$
$$\frac{r''}{\cos \phi_o} = 1.826 \qquad (16)$$

It is seen that the pitch angles as well as the radii R_p; R are equal on both members; and that the values are as listed in the table.

A face width $F = \frac{A}{3}$ results in a pitch diameter of 2.991 on both members. A pitch diameter of 3.000, in even figures, can be obtained by slightly altering the face width, or shifting it with respect to the mean computation point. This has been done in the tabulated example.

General Conclusions

In this series of articles the action and the properties of hypoid gears have been analyzed in an entirely new way. Hypoid gears, the most general form of gearing, have many peculiarities which cannot be anticipated by analogy with bevel gearing or other forms of gearing. New methods of approach had to be employed for their analysis. Mathematical proof had to be given to establish the validity of the calculations. The endeavor is, however, justified by the simplicity of the results. Here are some of these results:

Pitch surfaces have a different

4 : 3 TOOTH RATIO

Generated Hypoid Gears with equal blank dimensions on both members
20° mean pressure angle

Tooth numbers N', N''	18:24	18:24	18:24	18:24	21:28	21:28	21:28
Pitch diameters $D_p = D_g$	0.750	1.050	1.500	1.950	2.625	3.500	4.375
Shaft offset E	0.250	0.350	0.500	0.650	0.750	1.000	1.250
Face width $F_p = F$	0.156	0.219	0.312	0.406	0.550	0.730	0.910
Pitch angles $\gamma = \Gamma$	42°38′	42°38′	42°38′	42°38′	43°19′	43°19′	43°19′
Face angles $\gamma_o = \Gamma_o$	47°59′	47°59′	47°59′	47°59′	47°44′	47°44′	47°44′
Root angles $\gamma_r = \Gamma_r$	37°17′	37°17′	37°17′	37°17′	38°54′	38°54′	38°54′
Addendum at middle	0.026	0.037	0.053	0.068	0.077	0.103	0.128
Full depth at heel	0.076	0.106	0.150	0.195	0.217	0.289	0.361
Outside diameters $D_{po} = D_{go}$	0.800	1.120	1.599	2.079	2.768	3.690	4.613
Crown distance $C_d' = C_d''$	0.331	0.464	0.663	0.862	1.192	1.590	1.987
Spiral angles ψ_p, ψ	42°28′	42°28′	42°28′	42°28′	44° 7′	44° 7′	44° 7′
	10°26′	10°26′	10°26′	10°26′	16°52′	16°52′	16°52′
Limit pressure angle — ϕ_o	15° 1′	15° 1′	15° 1′	15° 1′	12° 9′	12° 9′	12° 9′
$R_p = R$	0.321	0.449	0.641	0.833	1.125	1.500	1.875
Q	0.590	0.826	1.180	1.535	2.121	2.828	3.536
$\frac{r''}{\cos \phi_o}$	0.543	0.760	1.086	1.412	1.750	2.333	2.917
Cutter diameter $2r$	1.100	1.500	2.000	2.750	3.500	4.500	6.000

Linear dimensions in., angles in deg. and minutes

1 : 1 TOOTH RATIO

Generated Hypoid Gears—20° mean pressure angle

Tooth numbers N′, N″	20 : 20		20 : 20		20 : 20		20 : 20		20 : 20		22 : 22		22 : 22	
Pitch diameters D_p, D_g	0.884	0.648	1.238	0.907	1.591	1.167	2.121	1.556	2.630	1.944	3.542	2.593	4.391	3.241
Shaft offset E	0.250		0.350		0.450		0.600		0.750		1.000		1.250	
Face width F_p, F	0.135	0.164	0.190	0.230	0.244	0.296	0.325	0.394	0.389	0.470	0.550	0.657	0.659	0.784
Pitch angles γ, Γ	51°36′	34°20	51°36	34°20	51°36	34°20	51°36	34°20	49°40	36°13	51°36	34°20	49°40	36°13
Face angles γ_o, Γ_o	57° 2′	39°26	57° 2′	39°26	57° 2′	39°26	57° 2′	39°26	55°18	41°31	56°37	39°2′	54°56	41°10
Root angles γ_r, Γ_r	46°10	29°14	46°10	29°14	46°10	29°14	46°10	29°14	44° 2′	30°55	46°35	29°38	44°24	31°16
Addendum at middle	0.027		0.037		0.048		0.064		0.080		0.097		0.121	
Full depth at heel	0.075	0.077	0.104	0.107	0.133	0.136	0.177	0.181	0.220	0.226	0.268	0.274	0.335	0.343
Outside diameters D_{po}, D_{go}	0.925	0.704	1.295	0.986	1.665	1.268	2.220	1.690	2.759	2.109	3.692	2.797	4.587	3.491
Crown distance C_d', C_d''	0.280	0.402	0.392	0.563	0.504	0.723	0.672	0.964	0.838	1.194	1.131	1.614	1.410	1.999
Spiral angles ψ_p, ψ	46°43	16°17	46°43	16°17	46°43	16°17	46°43	16°17	46°43	16°17	46°43	16°17	46°43	16°17
Limit pressure angle— ϕ_o	13°3′		13°3′		13°3′		13°3′		14°14′		13°3′		14°14′	
R_p, R	0.389	0.278	0.544	0.389	0.700	0.500	0.933	0.667	1.167	0.833	1.556	1.111	1.944	1.389
Q	0.543		0.760		0.978		1.303		1.675		2.172		2.792	
$\frac{r''}{\cos \phi_o}$	0.557		0.780		1.003		1.337		1.823		2.228		3.039	
Cutter diameter 2 r_c	1.100		1.500		2.000		2.750		3.500		4.500		6.000	

Linear dimensions in., angles in deg. and minutes

meaning on hypoid gears than on bevel gears, less meaning on the whole. An infinite number of pitch surfaces can be employed on a hypoid pair, whose tooth ratio and axes are given. The lengthwise curvature of the teeth depends on the taper of the pitch surfaces and vice versa.

To obtain the same tooth action and profile curvature on both sides of the teeth, unequal inclinations of opposite tooth sides are required with respect to the pitch surfaces, that is unequal pressure angles. The required difference of the pressure angles has been derived, and a general formula has been furnished therefor. Likewise the spiral angles and the lengthwise tooth curvature required for pitch surfaces of any given taper and size have been computed.

A basic member is capable of contacting both gears of a pair along the same lines, along which the gears contact one another during mesh. The crown gear, for instance, is a basic member for bevel gears. The existence of a helical basic member for skew-tooth hypoid gears had been recognized imperfectly by others before the complete analysis of the problem by the present author.

The earlier concept was confined to the case of straight teeth extending along the instantaneous axis, with twisted surfaces to maintain a constant pressure angle from end to end. This concept was arrived at by analogy, and as described was correct only for gears of 1:1 ratio. It was assumed that by having a helicoidal pitch surface contacting hyperboloidal pitch surfaces of the gears, the problem was solved.

Such contact of the pitch surfaces, however, is not sufficient for proper contact of tooth surfaces. It was also assumed that the axis of the basic helical segment had to intersect the instantaneous axis. This assumption can be correct only for a 1:1 tooth ratio, as in general there is a component of relative velocity in the direction of the instantaneous axis which requires the axis of the helical segment to be offset. See Figs. 22, 23, and 25, in which the axis C_x of the basic helical segment is offset from the instantaneous axis a distance E_x of which the value is expressed in formula (17a).

Even after this correction is made, however, the earlier concept did not cover the full meaning of the basic member. As has been shown here, the idea of a basic member need not be confined to any particular form or direction of the teeth. It applies broadly to all forms of teeth, straight or curved. Nor is it confined to any particular shaft angle made with the instantaneous axis. A pair of hypoid gears always will be fully conjugate to each other, when they are conjugate to a pair of complementary basic helical segments. To avoid undercut and tooth mutilation, the pressure angles and the lengthwise tooth curvature should conform to the principles here laid down.

A pair of teeth of bevel gears and of spur gears contact along a line, which is simply the normal projection of the instantaneous axis to the tooth surface considered. Also their surface of action contains the instantaneous axis and is tangent to the tooth normal at any point of the instantaneous axis. These relationships, so simple on spur and bevel gears, require determination on hypoid gears; and correct methods of analysis have been explained and applied. Finally, these articles have included discussion of tooth profile curvature in connection with surface compressive stress, and of sliding conditions in lengthwise and profile directions.

It may thus be said that the general problem of tapered gears with non-intersecting axes – hypoid gears – has finally been solved.

•

TIPS for Top Shop Men

101 Much as you'd like to, don't coddle a handicapped man. Help him to help himself by keeping him up to standards as far as possible. That'll give him more confidence in himself and more respect for you. Sympathy often causes more trouble than curiosity.

102 Watch medical records when you reassign a worker. Be sure he or she isn't physically or mentally unable to handle the job.

103 Don't let queer noises or operations prey on the green hand's mind. Tell him the thumps are drop hammers in the next building, the whir is a ventilating fan, the buzz a router.

104 Women are shorter, have shorter reach, grasp is smaller and less firm, can't lift heavy weights. Adjust table, work and seat heights to suit, put work closer, and adjust pedals and levers. Make use of sharper female eyes and ears, greater finger dexterity.

105 Shop lingo shows you know your stuff—but may leave the new worker completely at sea. Translate your own gab so they learn it too—they'll go home and show off to their "ignorant" relatives and bless you for giving them something to strut with.

106 Wolf whistles are not all the fault of either the gal with the shape or the fellows who watch her pass. It's your job to cut the limelight on her, to see that she wears sensible clothes, to give the whistlers enough to keep them busy.

107 Wages aren't the first concern of the average worker. He rates his job on these points, in order: is given help when needed, is encouraged to suggest new methods, is complimented on improvement, gets a square deal on grievances and a fair hearing, knows promotions are based on ability, is encouraged to ask advice—and gets good advice when he needs it.

108 Women don't take waiting as well as men—do your best to keep them occupied. When they're busiest, they're happiest.

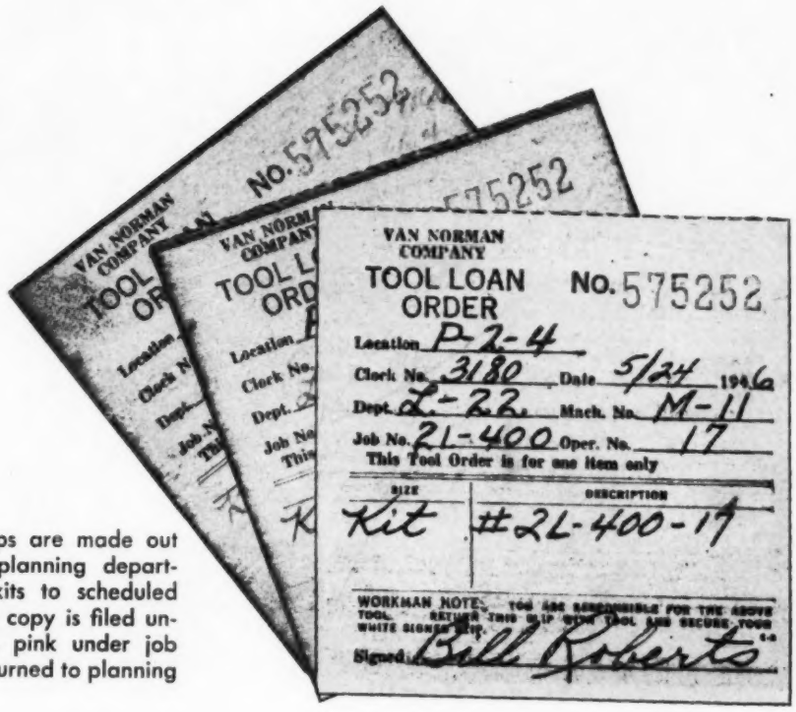
109 Watch the little things where women are concerned. Give 'em good rest rooms, clothes racks, neat working areas; notice sensible new clothes or special neatness. Ask their advice about cleaning or rearranging the department. They like to give advice—and will l-o-o-o-v-e you for asking.

110 Better be blind to women's charms—you're building a working force, not a harem. If you favor the gal with the figure, the rest will figure you are incompetent.

111 Most of us judge by first impressions—and a lot of us have the persistent ability to start off on the wrong foot. Give everybody a second chance before you make up your mind.

TOOL KITS CUT COSTS

BY MITCHELL MASTALERZ
VAN NORMAN CO.



Tool Loan Order slips are made out in triplicate by the planning department to route tool kits to scheduled operations. The white copy is filed under machine number, pink under job number and yellow returned to planning

Van Norman tool control gives faster and better service by issuing tool sets, controlling them by a flexible system and scheduling them to operations

ONE HOUR DELIVERY of all tools needed for an operation direct to the machine where the operation is to be performed is the task assigned to tool-crib service at the Van Norman Co. The least possible interruption in productive time for men and machines is the objective of both the planning department and tool-service.

Operations in manufacturing our line of machine tools and automotive equipment require as many as 40 tools in one setup. Everything that can possibly be done to help the operator make a change and get back into operation is taken care of before the tools reach him.

Detailed planning is done well in advance, but there are frequent adjustments that demand prompt service if our main objective of uninterrupted production is realized. While 1 hr. is allowed, delivery is often made in less time when an emergency arises such as breakdown or rejection of the product in operation.

It is generally accepted that any tool-crib organization should know the exact location of every tool at any time. The task assigned our cribs makes it absolutely necessary that our records be accurate and up to the minute. The management installed McCaskey tool-crib control some time ago as the most modern method of procuring the needed information and protecting our tool investment.

Cribs are held strictly to the 1-hr. limit. Any waiting time required of a machine operator or mechanic because of non-delivery of tools within the hour is charged to the tool-service department. Likewise, if a delay results from the failure of the planning department properly to schedule an operation and give the tool crib the hour notice, the delay is charged to the planning department.

Prompt, reliable service does not just happen. It must be carefully planned. As in many modern production developments, a worker-management committee was considered the best source for suggestions to outline what would be necessary to assure prompt service. A committee consisting of several representatives from the crib attendants, a planning man and the general foreman of tool cribs, under the chairmanship of an assistant to the plant superintendent, wrote a Standard Procedure that has given us the service required. It was not an easy assignment, but it has paid dividends.

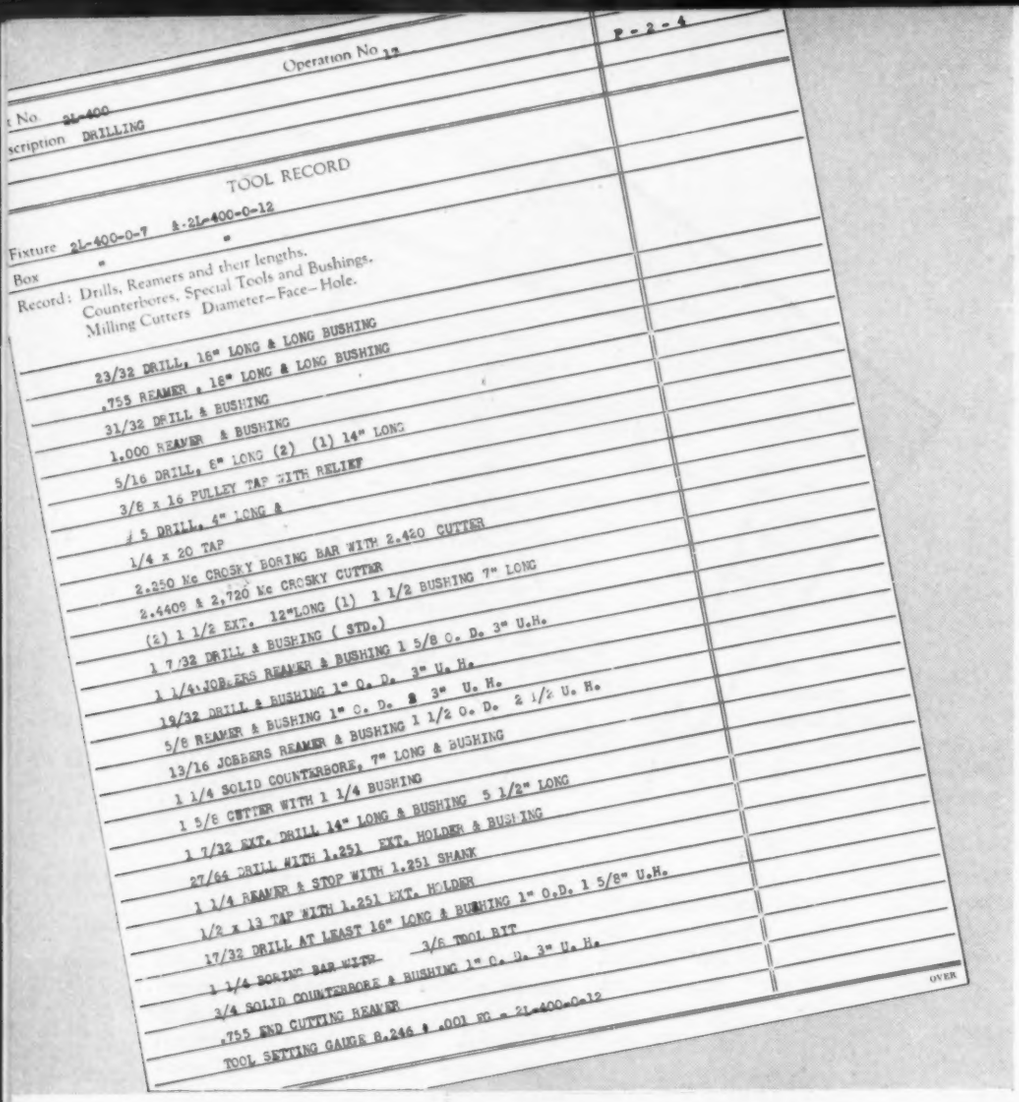
Tool-Crib Organization

At the present time we have three tool cribs in the plant. The crib personnel is classified in accordance with the general policy of the company relative to all occupations. There are four groups: truckers, clerks, attendants and tool-control men. All are up-graded from Class D or beginners, through Class C and Class B to Class A. Here is a brief description of the work required of Class A operators in each group:

Tool-crib truckers, as the name implies, transport the tools from the cribs or storage bins to the machines where they are used. A trucker must be thoroughly familiar with the plant layout and locations of machines and storage racks. It is his duty to do the heavy lifting of larger jigs and fixtures from shelves to the trucks. He must thoroughly understand and respect the care necessary in handling precision tools, as well as chain-falls and lifting devices required.

Tool-crib clerks must know and recognize all types of tools and measuring instruments, but should be particularly proficient in the clerical duties involved: filing, maintenance of records, making out orders for new and replaced tools, and in some cases typing.

Tool-crib attendants must not only be thoroughly familiar with all tools and measuring instruments, but must recognize any defect or damage when they are returned to the crib. This requires the correct use and reading of micrometers and other accurate measuring instruments. While not essentially clerks, they must understand the record system in order to locate any tool item.



Operation No. 12

P - 2 - 4

No. 21-400

Description DRILLING

TOOL RECORD

Fixture 21-400-0-7 & 21-400-0-12

Box " "

Record: Drills, Reamers and their lengths.
Counterbores, Special Tools and Bushings.
Milling Cutters Diameter—Face—Hole.

23/32 DRILL, 16" LONG & LONG BUSHING
.755 REAMER, 16" LONG & LONG BUSHING
31/32 DRILL & BUSHING
1.000 REAMER & BUSHING
5/16 DRILL, 6" LONG (2) (1) 14" LONG
3/8 x 16 PULLEY TAP WITH RELIEF
5 DRILL, 4" LONG &
1/4 x 20 TAP
2.250 Ke CROSBY BORING BAR WITH 2.420 CUTTER
2.4409 & 2.720 Ke CROSBY CUTTER
(2) 1 1/2 EXT. 12"LONG (1) 1 1/2 BUSHING 7" LONG
1 7/32 DRILL & BUSHING (STD.)
1 1/4 JOBBERS REAMER & BUSHING 1 5/8 O. D. 3" U.H.
19/32 DRILL & BUSHING 1" O. D. 3" U. H.
5/8 REAMER & BUSHING 1" O. D. & 3" U. H.
13/16 JOBBERS REAMER & BUSHING 1 1/2 O. D. & 1/2 U. H.
1 1/4 SOLID COUNTERBORE, 7" LONG & BUSHING
1 5/8 CUTTER WITH 1 1/4 BUSHING
1 7/32 EXT. DRILL 14" LONG & BUSHING 5 1/2" LONG
27/64 DRILL WITH 1.251 EXT. HOLDER & BUSHING
1 1/4 REAMER & STOP WITH 1.251 EXT. HOLDER
1/2 x 13 TAP WITH 1.251 EXT. HOLDER
17/32 DRILL AT LEAST 16" LONG & BUSHING 1" O.D. 1 5/8" U.H.
1 1/4 BORING BAR WITH 3/8 TOOL BIT
3/4 SOLID COUNTERBORE & BUSHING 1" O. D. 3" U. H.
.755 END CUTTING REAMER
TOOL SETTING GAUGE 8.246 ± .001 RG - 21-400-0-12

OVER

Kit Cards are designed under the part and operation numbers and list all tools needed for the particular operation. Only one tool loan order slip is filled in to draw the kit from the crib, with the kit number serving as the description

Tool-control men must be able to read blue prints and use all precision instruments. They must be able to take a new operation and, working from blueprints and operation sheets, list all tools required for the operation, check all the tools listed and recognize proper grinding, cutting edges and fit.

The three cribs in the plant are referred to as the main crib, steel crib and third-floor crib. The third-floor crib faces only the usual problems and its activities are covered completely by the conventional McCaskey system. Emloyees sign a triplicate receipt, a carbon-backed Toll Loan Order, whenever they receive a tool. The yellow duplicate copy of the slip is retained by the operator, the white original is filed under the man's name on a control panel board and the pink third copy in front of a tool card on a clip-spring board. An inventory and activity card gives full information regarding the item.

Thus, the responsibility of any individual is established by the white slip on file under his name, and the exact location of each tool on inventory is shown by the copies on file in front of the card, in conjunction with the figures on the card. When a tool is returned, the pink copy is filed behind the card. The total number of pink slips are counted once a month to give the frequency with which the item is used.

One situation that may exist in any crib is that tools not permanently stored in the crib may be requested by operators. In such cases the crib attendant makes out a Tool Loan Order for the item, signs it himself and presents it to the main crib for the required tool. The pink copy is filed under the item in the main crib files, and the white and yellow copies are retained by the borrowing crib attendant. He delivers the tool to the operator, has the slips countersigned, gives the operator the yellow copy and files the white copy under the man's name in the crib file.

When the tool is returned, the white copy is surrendered to the operator as usual. The yellow copy is taken to the main crib by the crib attendant with the tool. It is stamped "RETURNED" and retained by the attendant as his receipt. The pink copy is cleared in the conventional manner.

If plans dictate that in the future the new item should be kept available, the item is requisitioned from the main-crib new-tool stock and added to the inventory at the particular crib where it is to be used. It is then issued in the usual manner rather than by using the temporary-loan procedure.

Issues Tools in Kits

Most of the tools called for from the main and steel cribs are issued in kits. Operations at Van Norman usually require a large number of items, and the best setup is the result of considerable study. The tool list found to produce the best results is made a matter of permanent record. A master stencil of the list is kept available, with as many copies as needed on file in the cribs.

Kits are designated by number, using the part and operation number as the kit number. Only one tool-loan order need be filled in to procure a full kit, by simply designating the kit number in the block for "description." All the items included are a matter of record, but a copy of the list is always delivered with the kit to help the operator keep in mind all the tools placed in his charge.

Issuing the kits from the main crib permits collecting all the items required and keeping them together. Thus, a 1-in. reamer or a ¼-in. drill that is placed with a kit for a particular operation is deducted from the general-purpose reamer or drill inventory, and carried only as part of the kit.

The activity of the drill and reamer inventory would not include the number of times they were used in the kit. It does make them available at all times for the kit and leaves the tool item accounts in condition for check and verification at any time, without the clerical work otherwise required to take kit transactions into account.

The planning department makes out the triplicate tool-loan order sets for the kits needed for scheduled operations. As this is usually done well in advance of schedule, the time required is noted on the slip, as well as the machine number where the work is to be done. When a tool-loan

order is received by the tool-crib clerk, she pulls the kit card and gives it to the tool-control man.

When all the tools for many of our operations are assembled, the total weight is considerable. Often special lifting devices or chainfalls are required to remove them from shelves to trucks or benches. At the direction of the tool-control man, a tool-crib trucker moves the kits from shelves to the tool setup bench. The tool-control man assembles the tools in their proper holders, checks them against the list for any shortage and checks the condition of all tools, clamping devices, jig fits and cutting edges. In short, he does everything possible to prevent delay and reduce the setup time of the machine operator.

When he is sure everything is in order, the kit card is returned to the tool-room clerk. She then files the white copy of the tool-loan order under the machine number where the tools are to be used, and the pink copy under the clip for the job number. The yellow copy is handed back to the tool-control man, who in turn gives it to his tool-crib trucker with instructions to deliver the prepared kit to the machine indicated. The tools and a copy of the list are delivered to the machine, and the yellow slip is sent to the planning department.

When a job nears completion, the planning department must schedule the next job. To save time, the planner delivers the yellow copy for the tools to be collected at the same time he delivers the triplicate set for the next job. The yellow copy is filed in place of the white copy under the machine number, and the white copy given the tool-crib trucker as a directive to collect the tools.

To avoid delay, a new kit must be delivered before the used one can be collected, but when it is collected, it will be returned to the setup bench. The yellow and pink copies of the tool-loan order are now cleared from the files, the white copy signed by the tool-control man and held for reference for a period of one week.

Inspects and Sharpens Tools

The kit is "broken down," all tools are inspected, and those requiring repair or sharpening are tagged for the tool-grinding department foreman. Broken tools will be replaced, and any missing items investigated. A tool replacement report must be made out for any items damaged beyond repair or lost. When tools have been inspected, repaired, or re-sharpened, the tool-crib trucker returns the kit to its proper shelf location.

The same routine is followed in the steel crib except that the kits are not usually kept and stored completely intact. Kits for this department include many expensive carbide tools and cutters. One high-priced tool might be used on a number of operations, but not frequently enough to warrant stocking the tool for exclusive use with each kit. A file, therefore, is required to indicate the exact location of each item, the total number available or on inventory and the frequency of use.

The master kit card will first list all the items that are used on that operation exclusively. The fact that they are stored together will be indicated by the same bin number appearing for the location of the items kept together. The items, stored by classification and not with the kits, can readily be detected by observing that the bin in which they are stored will have a different number from the one showing the location of the first part of the list.

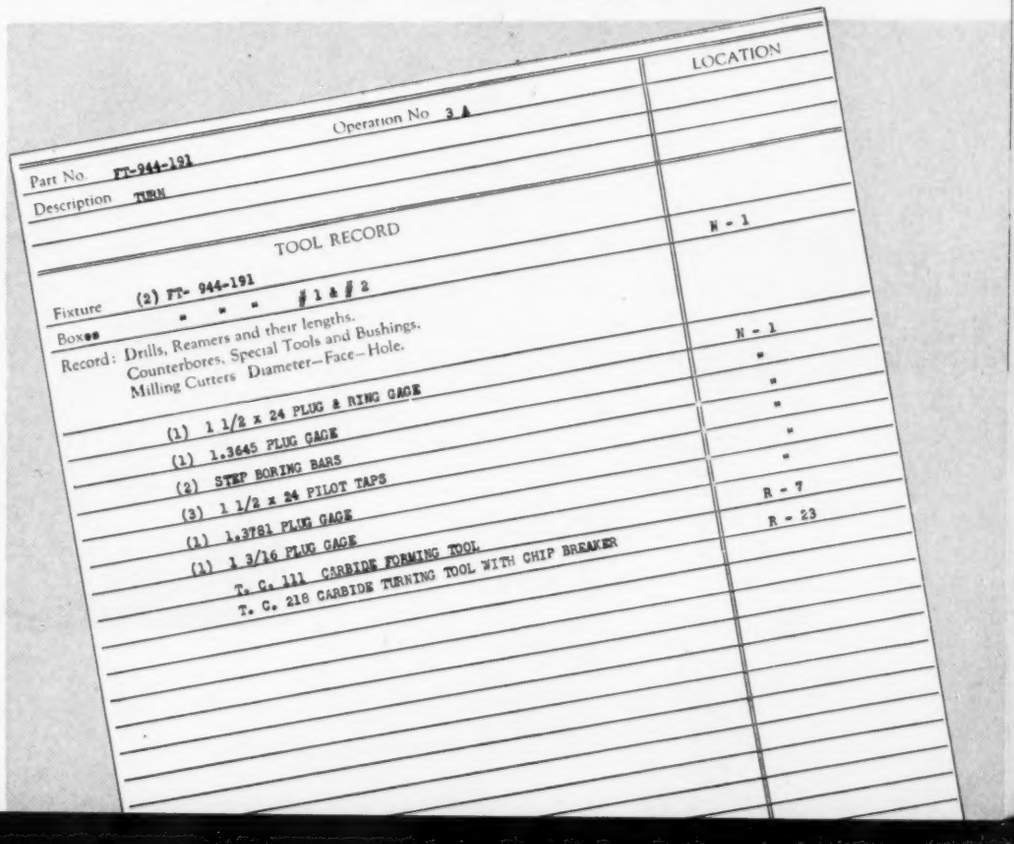
The planning department makes out a tool-loan order form notifying the crib of tools needed to meet schedule, the same as previously described for the main crib, and the tools are located, moved to and assembled at the tool set-up bench in the same way. However, the tool-control man does make out another set of tool-loan order forms for each item not stored with the kit.

The pink copy of the order for the kit is filed under the operation number as in the main crib, but the pink copies for items kept by classification are filed under the clip with the inventory and activity record for that item, as in the case of general-purpose tools. All the yellow copies are delivered to the planning department when the tools are delivered to the machine and the white copies are all filed under the machine number where they are being used.

Old records show as high as 60 delays in one day caused by tool shortages. Current reports, day after day, show only two or three. Most of these are unavoidable, such as time required to make a major repair, delayed delivery of a new tool, etc. It is rarely caused by failure of the scheduling or delivery service.

This procedure has now been in force for several months and has reduced the lost time at machines to an extent that it is reflected in increased over-all efficiency of the operating departments. We are giving faster, better tool service and yet we are taking care of the same number of employees and comparable production at less cost and with fewer crib attendants than were required under the old check system.

Master Kit Cards, used when kits are not stored intact, show which tools are stored together and which are stored by classification rather than with the kits. The bin location given with the description of each tool simplifies making up the kit when needed



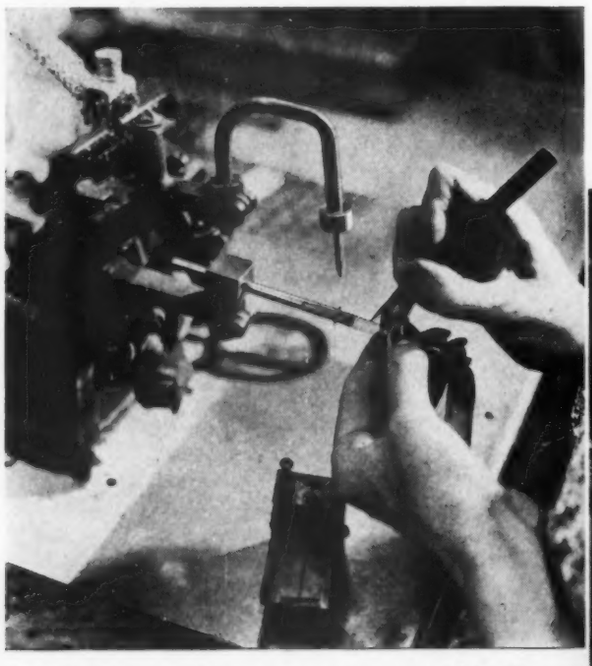
Part No. FT-944-191 Operation No 3 A
Description TURN

TOOL RECORD

	LOCATION
Fixture (2) FT- 944-191	
Box " " " # 1 & # 2	N - 1
Record: Drills, Reamers and their lengths. Counterbores, Special Tools and Bushings. Milling Cutters Diameter—Face—Hole.	
(1) 1 1/2 x 24 PLUG & RING GAGE	N - 1
(1) 1.3645 PLUG GAGE	"
(2) STEP BORING BARS	"
(3) 1 1/2 x 24 PILOT TAPS	"
(1) 1.3781 PLUG GAGE	"
(1) 1 3/16 PLUG GAGE	"
T. C. 111 CARBIDE FORMING TOOL	R - 7
T. C. 218 CARBIDE TURNING TOOL WITH CHIP BREAKER	R - 23

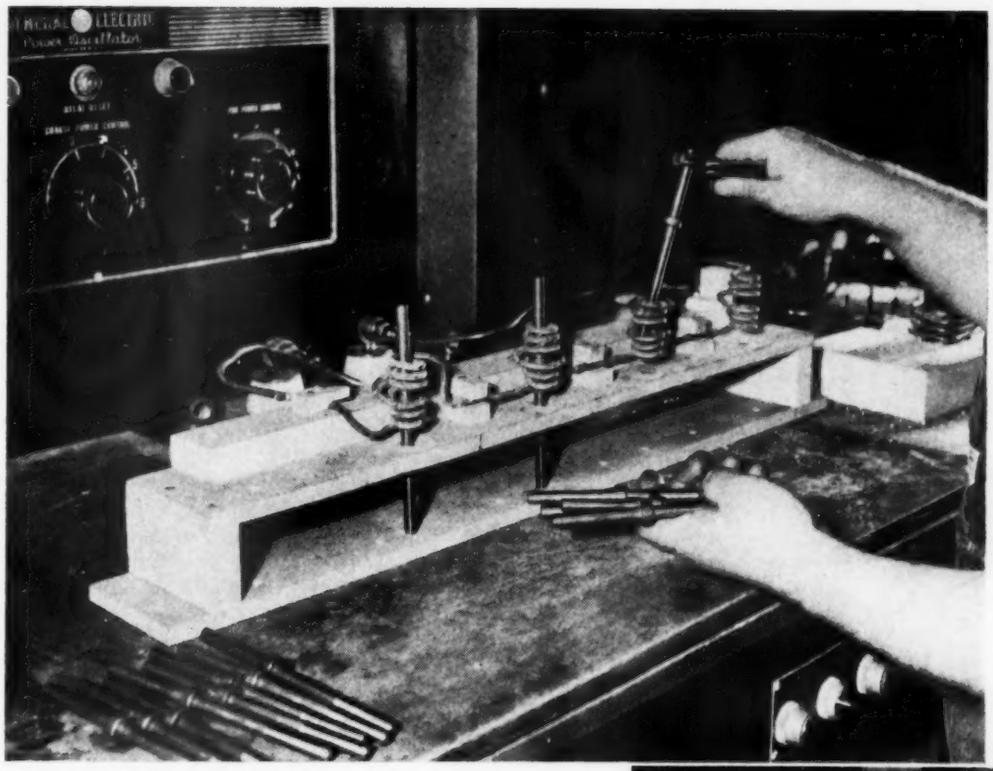
SHOP SHOTS

Double-acting Fixture. Two-position induction-heating fixtures, connected to the oscillator through a large transfer switch, make it possible to heat an assembly for brazing while a previously brazed assembly is cooling. The fixture shown is mounted on a special table set beside a 15-kw. GE oscillator. A heavy two-pole double-throw switch under the table is operated by the large lever through the table top. When a magnet assembly has been positioned in a fixture coil, the switch is thrown to connect that coil to the oscillator. Then the foot-control switch turns on the power. While the assembly in this fixture is heating, the assembly in the alternate position has cooled sufficiently for exchange. It is easy to change coils so other jobs can be done.



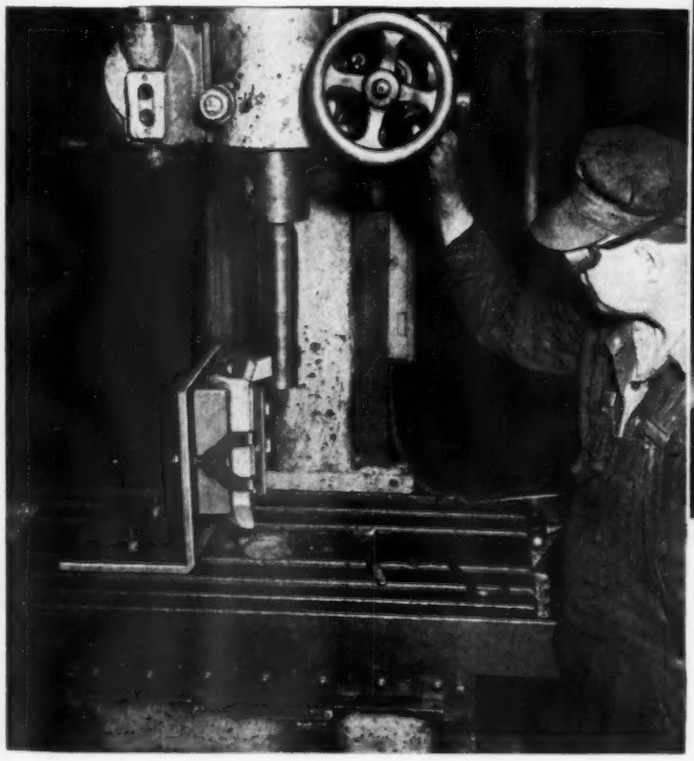
Tweezer Trouble. An operator spotwelds tantalum grid wires (0.007 in. dia.) to tantalum sleeve for a VT90 transmitting tube at the Brooklyn plant. Parts handled are extremely delicate. After welding is completed, the assembly is placed in the jig (lower center) to see if it is properly aligned. *Amperex Electronic Corporation.*

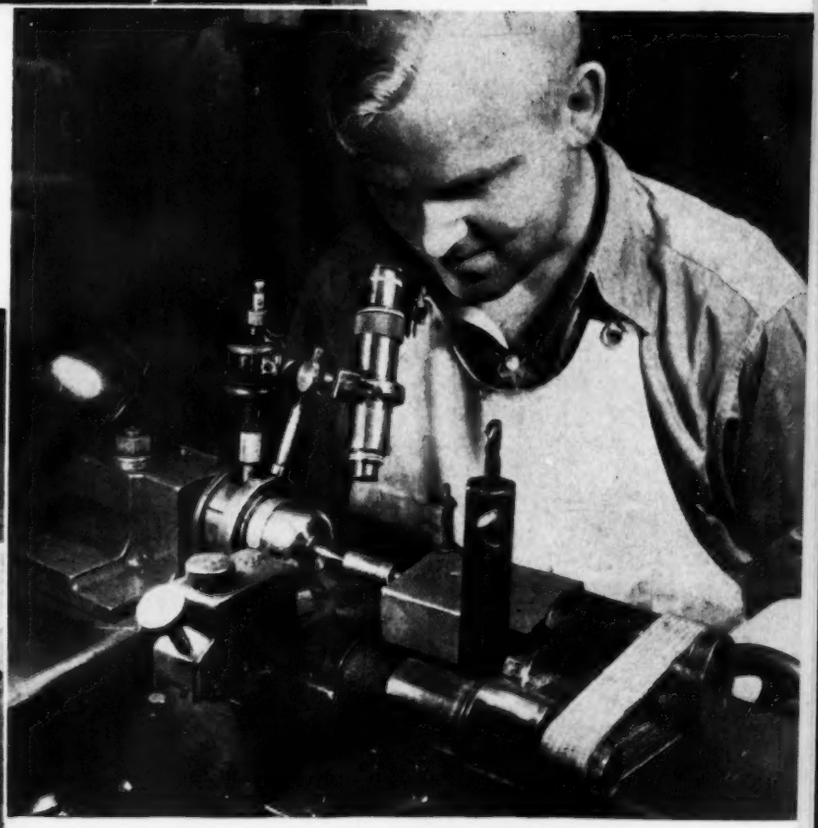
Dual Boring, Dial Checking. The operator is checking anvil holes in dial-indicator snap frames with a Sheffield Precisionaire. The snap frame is held in position by a dual fixture mounted on a boring machine which performs the two boring operations simultaneously. Plain plugs were formerly used to gage these parts, but were slower and less accurate



Production Induction Brazing. Multiple coil fixtures for induction brazing more than justify their cost on long-run jobs when the coils can be balanced properly for even heating at each position. This fixture has four coils in series with the terminals of the GE 15-kw. oscillator, and is used for brazing steel collars on 5/16-in. diameter cold-rolled steel rods. Fixture is of Transite, arranged to support coils and locate rods so they are properly centered. *A. H. Hyndman Company.*

Brass Borer. A jig, bolted to the drill table with two large bolts and adjusted by loosening the nuts and sliding the jig back and forth on a slotted table, enables tank wheel journal brasses to be bored rapidly and accurately. The brass is held in the jig by two clamps, one on each side, and can easily be removed by loosening the nut on each clamp. *Ray G. Thompson, Erie Railroad Company.*





Narrow 'Scope Grinding. With the grinding wheel revolving at 50,000 rpm, this machinist watches by 'scope while he is grinding the orifice in a pintle-type diesel injection nozzle. Diameter of the hole is 0.039 in., and accuracy must be held within 0.0002 in. *American Bosch Corporation.*

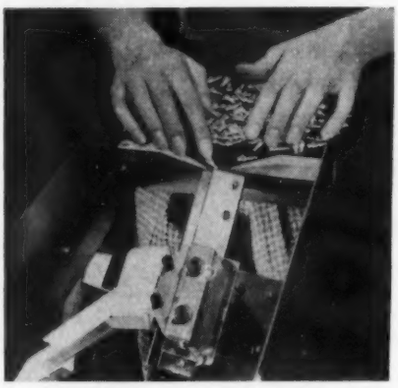
Electronic Relay Systems

THE INVISIBLE DOORMAN, acting instantly when a beam of light is broken, is an application of the electronic relay. Another is the automatic sorting of precision parts as rapidly as they are fed into an inspection machine. In industry, science, commerce and entertainment, processes are started and stopped, and things are turned on and off, automatically by the electronic relay.

Although the applications of this device are sometimes spectacular, it is basically only a refinement of the principle of putting electricity to work by completing a circuit.

The most familiar way of completing a circuit is by closing a switch manually. Almost as familiar is the method of remote control using an electromagnetic relay or contactor. The magnetic contactor consists of a load circuit switch in the load circuit and a magnetic coil in a contactor circuit, which also includes a battery and the control switch.

When the contactor circuit is completed by closing the control switch, the magnet coil is energized. Its magnetic attraction closes the load circuit switch, completing the external load circuit. In this way, the contactor acts like an amplifier inasmuch as a relatively weak current in the contactor circuit controls the flow of a large current in the external load circuit. The small power required to operate the contactor permits the use



Precision parts can be sorted for size by means of an electronic relay

of small contacts and light pressure to close the circuit. And so, by making and breaking the circuit of the contactor coil with a sensitive contact-making device, we can make our relay respond exactly to some controlling factor.

Our contactmaking device might be a pressure gage, with sensitive contact points which close at some critical pressure. It is often a thermostat whose sensitive contacts control the regulation of automatic heating installations. As a matter of fact, the contact-making devices can be designed to respond to almost any mechanical, electrical, or chemical effect which we wish to measure or control.

The simple contactor-type relay has a good many uses, but it also has some important limitations. For science and industry require a sensitivity of response of a much higher order. To meet this requirement, we have the electronic relay. A trickle of water, the weight of a thread, even the flicker of light are sufficient to energize this relay.

Consider the problem of the device which must respond immediately to any one of a large number of possible feeble signals. The moment there is a break in any one of the hundreds of threads in a textile machine, the shut-down must be immediate.

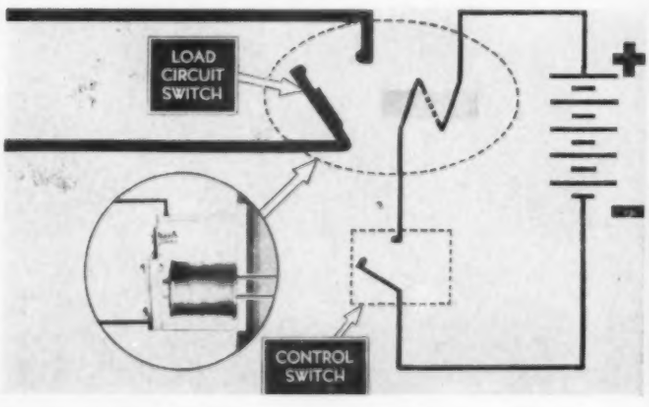
Another example is that of employing the feeble electrical response of a phototube to actuate the counter in the photoelectric counting of objects moving along a conveyor belt.

The contactor type of relay cannot provide the sentivity required for these operations. But, by taking advantage of a few basic principles of electronics, we can multiply the sensitivity and the usefulness of the relay by hundreds and even thousands of times.

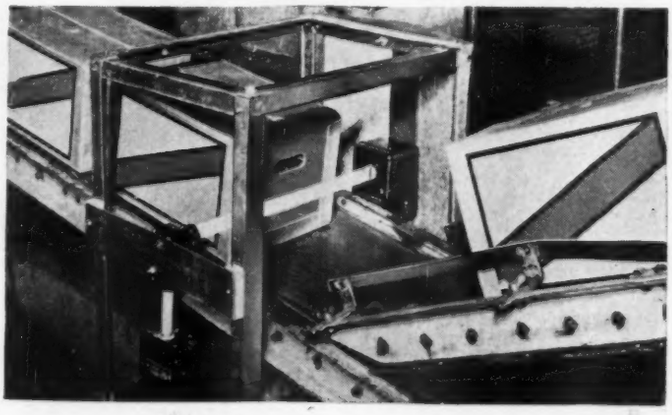
We shall become acquainted with three principal types of electronic relay equipment.

1. The contact amplifier relay.
2. The time-delay relay.
3. The photoelectric relay.

Based on a sound slidefilm in the General Electric industrial electronics course.



A magnetic coil in the contactor circuit closes the switch in the load circuit



Among the many functions of the electronic relay is counting objects passing by on a conveyor

Practical Ideas

Air Pressure "Inspector" Simulates Working Load

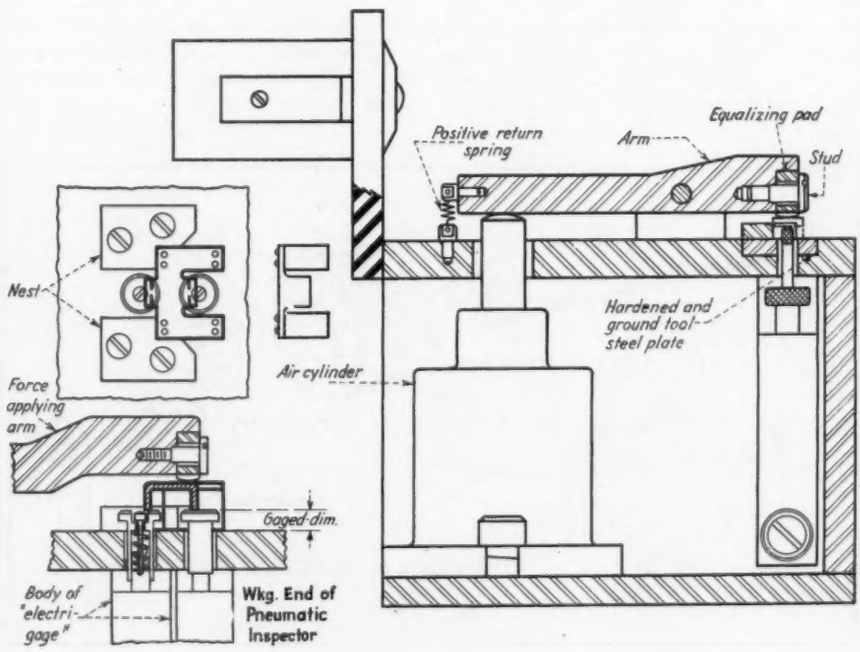
CHARLES TOFFEL

Here is a three-purpose testing machine that is ideal for checking small assemblies. Not only does it measure the critical dimension(s) under the actual working load, but it also uncovers possible assembling defects which would be unnoticeable otherwise. By the use of Electric-gages, several dimensions on the same unit can be taken simultaneously, the measurements are automatically compared to the designed tolerances, and the indications (colored lights) show whether the part is within or over or under size.

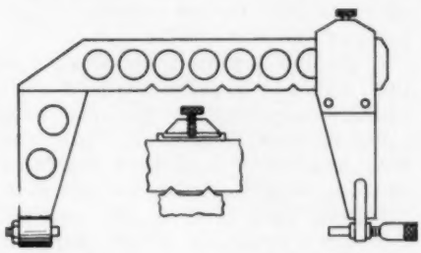
We built up this steel box to house several gages and the air cylinder with its clamping lever. Then, nests and suitable attachments can quickly adapt the pneumatic "inspector" to check a batch of small units of any kind. A pressure regulating valve can be installed, and the lever arm made variable; with these two adjustments, practically any force desired can be obtained.

One possible application of the device which will serve to show its versatility is testing small springs. These can be measured at their free length, then compressed under known load and measured again.

The job currently in the "inspector" is a three-piece soldered assembly. Two Electri-gages measures the distance from the two heavy legs up to the two bent lugs. The load is evenly applied and, although the two distances are supposed to be the same, one measurement would not suffice. So, instead of getting the information with two tests, both readings appear simultaneously on the light panel.



Universal pneumatic testing gage gives several simultaneous dimension readings while the part is under working load



This adjustable micrometer does the work of 12 tools

Adjustable Micrometer Is Easy to Make

JAMES TAYLOR

Mechanics and operating engineers are frequently called upon to do a job which requires a larger micrometer caliper than is usually found in the small shop or toolbox. I made this one in odd moments after wasting time equivalent to the construction itself in chasing the needed one down every so often, and there are times when the required size just isn't around. This is definitely something to be made in "fair weather" against some future emergency because it requires precision tools to make—when there would be no need for such a tool as this at all.

This mike is adjustable from 3 to 9-in. by 1-in. steps but I'm contemplating a larger one to take work of 14-in. diameter. The backbone is a piece of tool steel 2 in. wide ground parallel on both edges. The fixed anvil is welded on and provided with a fine pitch screw for small adjustments. The adjustable anvil is built-up to slide on the backbone and carries a precision clamp for the micrometer head. The center, long piece of the adjustable arm is first ground off leaving two 60°-points precisely 1 in. apart. Then the mike head is temporarily assembled in approximately the

right position and the arm brought down to the 3-in. position in order to mark the first notch in the backbone correctly. Carefully grind 8 notches in all, exactly 1 in. apart. Keep the depths uniform and less than the depth of the two points so the sides of the v-points will bear firmly and evenly in the notches. Lap these surfaces and check in an optical comparator.

Assemble the adjustable arm and fit the gib and tightening screw. Set it at the 3-in. position and adjust the mike to read zero and lock its bracket in place. Care must be taken here, of course, to insure absolute alignment of the two anvils.

A possible addition, or added feature, would be to make the fixed anvil double-headed as it projects both ways anyhow, and then make the mike head reversible. Now you have an adjustable inside caliper as well.

Unless, and even if the steel is thoroughly seasoned, it will change a little with varying atmospheric conditions so it would be well to check the tool periodically against a known distance, preferably its maximum measurement.

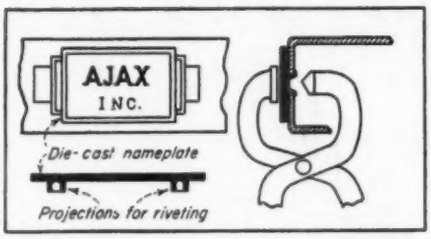
For some work where micrometer accuracy is not necessary, yet where firm-joint caliper-and-scale would be a little clumsy and slow, a simpler tool could be made along these lines which would read in decimals easily and quickly when you don't care about the third figure behind the point. In fact, I once saw a 24-in. micrometer made out of well-seasoned wood. It was very light and excellent at the job for which it was intended.

Quick Lathe Setup Cuts Short Wire Lengths

JOSEPH F. BUDNICK

A set of five simple parts can quickly convert a lathe into a wire trimmer temporarily when a power press isn't to be plated is bared simply by cut- available. The cutter is a toolbit rotated in the headstock at a slow speed and the wire is fed longitudinally by hand.

A boring-bar like tool consisting of a slotted arbor and a right-angle bit rotates in the lathe chuck. A hardened, button-head bushing is adjusted in the toolpost until it just skims the cutter. Wire is fed through the bushing up against an adjustable collar which measures the wire length, and every revolution of the spindle will chop off a piece. Spindle speed should be about 120 RPM.



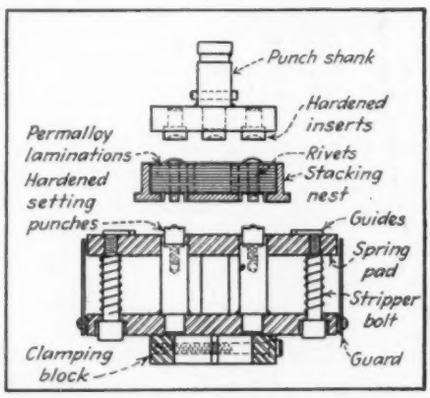
NAMEPLATES and other small die-cast trimming can be assembled to the parent component without fastenings if alloy in the casting isn't too hard or brittle. It should be fairly simple to change the mold for the bottom to cast the two tubular rivets on the nameplate. Any punch or squeezer can do the rest.—*S. Framurz.*

Combination Fixture Stacks and Rivets Magnetic Laminations

JOHN JOSEPH KOSTER

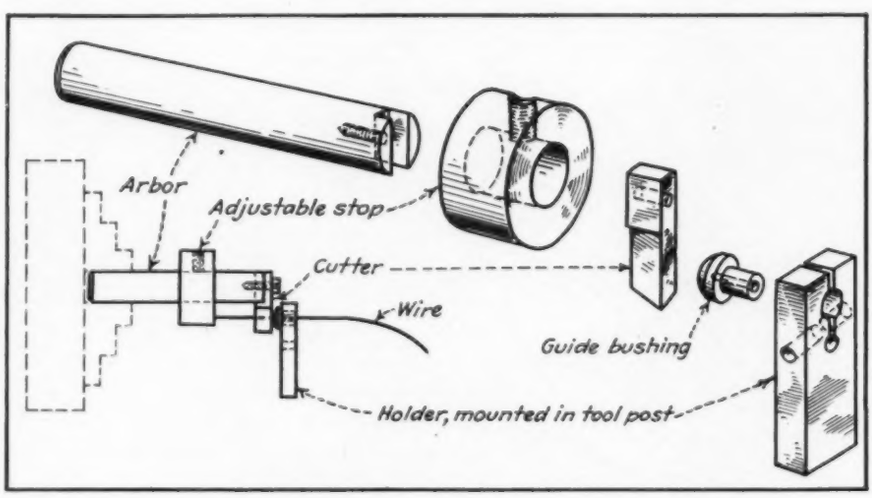
Anyone who has tried knows how tricky it can be to line up the holes in a large stack of thin laminations. Here, the problem was to drive four rivets to assemble a small magnetic core, and aside from alignment there was also the necessity for clamping the stack at an even compression pressure all over during riveting to insure that the thick stack would have parallel faces when finished. This was made more complicated by the material involved. To cut down eddy current losses a flaky scale is deliberately placed on the thin metal sheets, and in a large stack this has a lot of compressibility. In addition, any slight burr will have to be compressed out to make a tight assembly.

There are probably many ways to solve such a problem, but most of the answers would mean a compound die. Here, the stacking nest which aligns the laminations is separate from the press so the stacking can be done away from the cramped quarters under the ram. Also, it divided the operation so the press can be kept running automatically as fast as loaded nests can be fed to it, instead of having just one person load the nest slowly in the press, insert the rivets, and



A separate nest simplifies loading; if desired, several nests can be kept in constant rotation in order to gain full utilization of the press

then bring down the ram, tying up the machine for a lot of hand work. This separate-nest method, it happens, is adaptable to a simple spring-pad which assures the even clamping pressure.



With these tools in your crib, any idle lathe can momentarily be set to cut a few uniform wire lengths

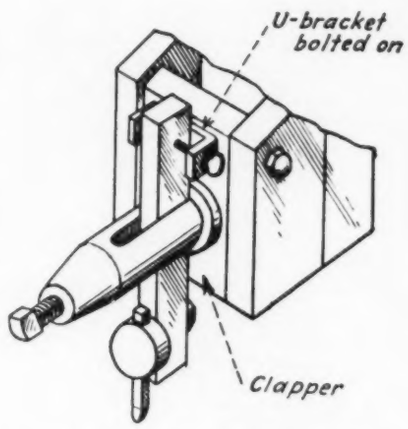
The procedure from start to finish is this: Load laminations into the nest until the top one comes flush with the sides of the nest. This gives the correct number without counting them out. Place the loaded nest in the guides on the spring pad and drop the rivets in the holes. Bring down the ram. The punches will first bear on the rivet-heads pushing the spring pad down evenly until the projecting ends of the rivets contact the setting punches. The spreading then takes place when the stack is compressed to the maximum.

U-Bracket Prevents Slew In Single Screw Shaper Toolpost

HAROLD BAIRD

Considerable side thrust in most shaper work tends to deflect the tool in its single-screw toolpost.

Here is a device which I believe to be original, as I have never seen it elsewhere, to brace and stiffen the back of the toolholder and thus permit heavier feeds without danger of slewing. It consists of a U-strap screwed to the clapper so as to clear the clapper-box and not interfere with the return stroke. The sides of the U are drilled and tapped and carry opposed screws which tighten against the toolholder to make a much stronger mounting.



Side-thrust and resulting tendency to twist are offset by bracing the rear part of this shaper toolholder

Boring Large Holes in Bakelite With a Small Van Norman Miller

NORMAN BRACKETT

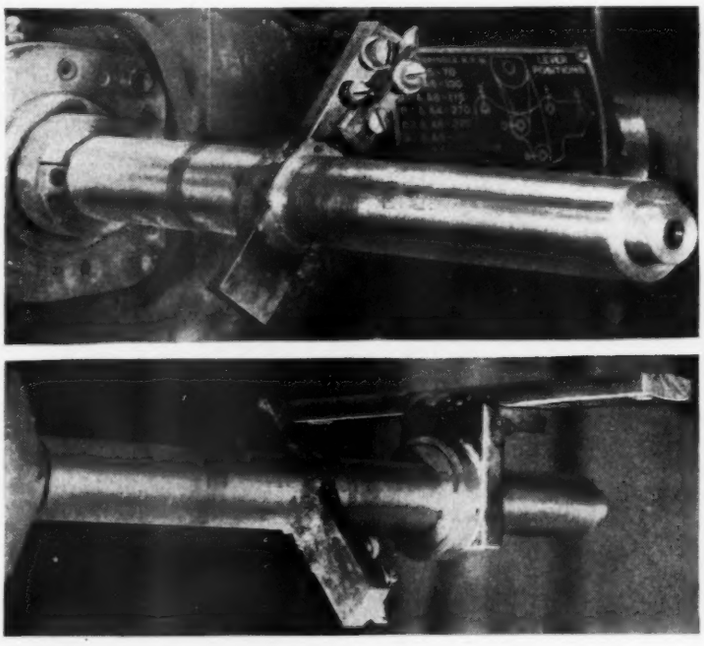
Shop Superintendent
Fisk Engineering Company

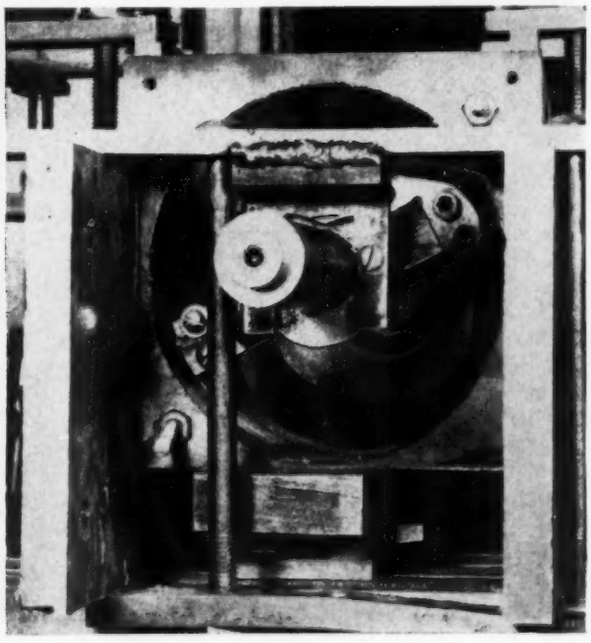
Recently it was necessary to bore a 6⅜-in. hole through a rectangular block of bakelite and our miller didn't have enough space between overarm and spindle to allow the overarm center to steady a long boring bar in the usual fashion.

As the bored hole was so large that it nearly broke through the sidewalls of the block, plates were erected alongside the block to back up the work and also to serve as supports for the shopmade outboard bearing. A boring bar was welded up from two short pieces of bar stock with a flat piece between to hold a single-point tool. After assembly, the bar was turned true and then a bearing was made to slip fit on the bar and to bolt to the side support plates. Thus, the setup acted as its own follow-rest.

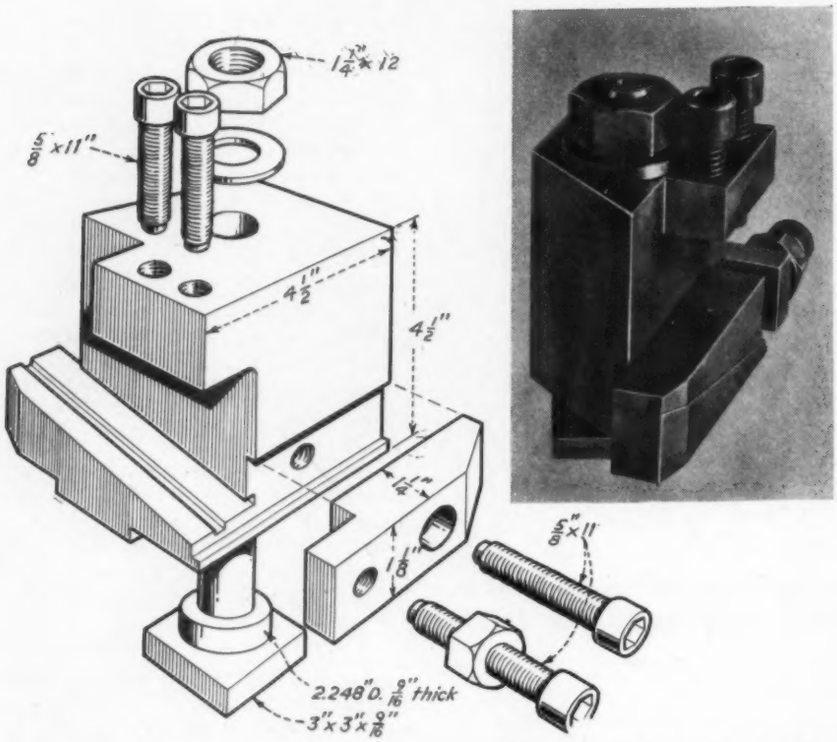
The bakelite was a cemented stack of sheets totaling 7 in. in length. The hole had to be 6⅜ in. in diameter plus or minus 0.002 in. with about a No. 20 micro finish. Not having an accurate lathe large enough, this setup was devised for our No. 12 Van Norman miller, after the piece had been roughed out in the lathe to 6 in. in diameter.

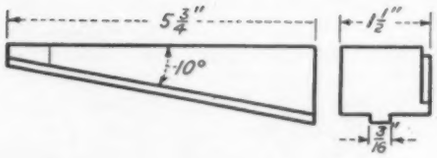
The boring bar was made of two pieces of 2-in. stock. The first was 5 in. long and turned on one end to fit the largest draw-in collet. Next, the plate was welded on and then the assembly was rechucked in the lathe to true up the two parts, and turn a male pilot on the other end. The second bar section, 8 in. long, was bored to fit the pilot and then welded in place. Again, the assembly was given a light cut for concentricity and finally turned to the bearing diameter.





Left, details of welded-up boring bar and sliding sleeve bearing; right, the setup on a milling machine. The piece is 7 in. thick and the thin sidewalls are backed up with steel plates which also serve as bearing support





Above, good support for the tool is combined with maximum clearance permitting heavy cuts even in confined locations. Left, 10° sliding wedge gives sensitive vertical adjustment

Adjustable-Wedge Toolholder for High-Load Carbide Turning

CHARLES BILY
Naval Torpedo Station, Alexandria

Modern high-production with carbide-tipped bits has outgrown the old-fashioned rocker-type toolpost, which is not only slow and hard to set with any kind of accuracy—to get the full advantage of optimum rake and clearance angles, but is also comparatively weak and flimsy.

Of course, many open-side block toolholders have been built already but this one embodies many good features and it has been thoroughly tested in severe service. It is being offered, with dimensions, to spare those who may be interested, the trouble of experimenting and designing their own.

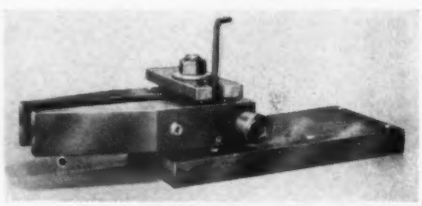
Advantages of this toolholder are many: (1) The position in which the tool is held in relation to the work remains constant at all times, thereby insuring the correct clearance and top rake angles. (2) The tool can be raised or lowered to the centerline of the work very easily and quickly, facilitating compensation for regrinding. (3) Tool chatter is eliminated because the tool is clamped in place by several screws on a level surface. (4) The wedge cannot fall out of the holder and get lost as rockers are likely to do. (5) The same size Allen wrench operates the wedge and tightens the tool. (6) Time is not lost in looking for shims to raise or lower tool to the desired center height. (7) Tool overhang is held to a minimum by the extension of the wedge and its base out beyond the main body of the toolholder. (8) Facing or turning close to chuck jaws, collet or any holding device is possible because the bit is flush with the side of the holder. (9) The angle on the front of small-size toolholder permits the use of the tailstock in very close behind the tool and holder. This also increases the operator's visibility. (10) Right- or left-hand toolholders permit the use of right- or left-hand turning and facing or boring tools. (11) Further modifications are possible. Toolholders can be made in several sizes, with or without tongues. For large work, the T-slot tongue is desirable because of its added strength. For smaller work, the ability to turn the toolholder in any direction outweighs the advantage of a tongue. Also, two or more toolholders can be used simultaneously on the same carriage for multiple cuts.

Leveling Screws Adjust Toolmaker's Clamp Precisely

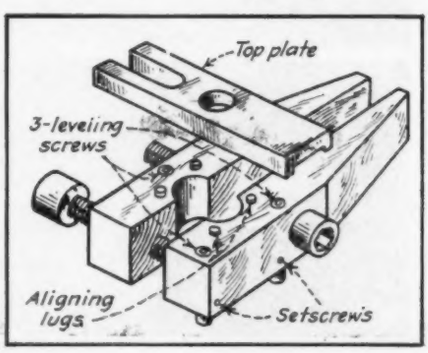
FRED T. OETJEN

The problem of holding small parts for inspection and gaging, especially when complex angles or reference surfaces are involved, usually brings forth quite a collection of clamps and blocks and the final adjustments are always finicky. This combination of a conventional toolmaker's clamp, modified slightly, and a universal joint, leveling screws and flat base plate, makes a fixture which can be placed in any position and locked rigidly, and then precisely adjusted a full 360° in the plane parallel with the plate and up to 5° out of this plane in any direction.

To make the conversion, first assume that a conventional clamp is available and has been annealed, or the case removed. Lay out four holes on the top of the closed clamp. The first is on the line of the jaws so the hole will be half in each jaw; the other three form an equilateral tri-



Allen wrench here fits between the forked end of the cross-piece to adjust one of the leveling screws



After setting the leveling screws the central bolt tightens the clamp

angle with two in one jaw so as to miss the clamping screws and the third midway between the screws in the other jaw. The center hole is for the large ball-headed pivot screw which allows the clamp full freedom of movement and the other three are for the leveling screws which bear against the plate. The clamp also requires three small setscrew holes to intersect the leveling-screw holes, and four holes to receive projecting dowels to keep the cross-piece lined up.

To assure rigid clamping and prevent twisting under the strain of the leveling screws, a cross-piece is made to fit under the pivot-bolt. This is slotted in one end to clear the single leveling screw and channeled to fit over the four guide lugs.

The flat plate permits mounting the assembly on an angle plate or any convenient reference surface.

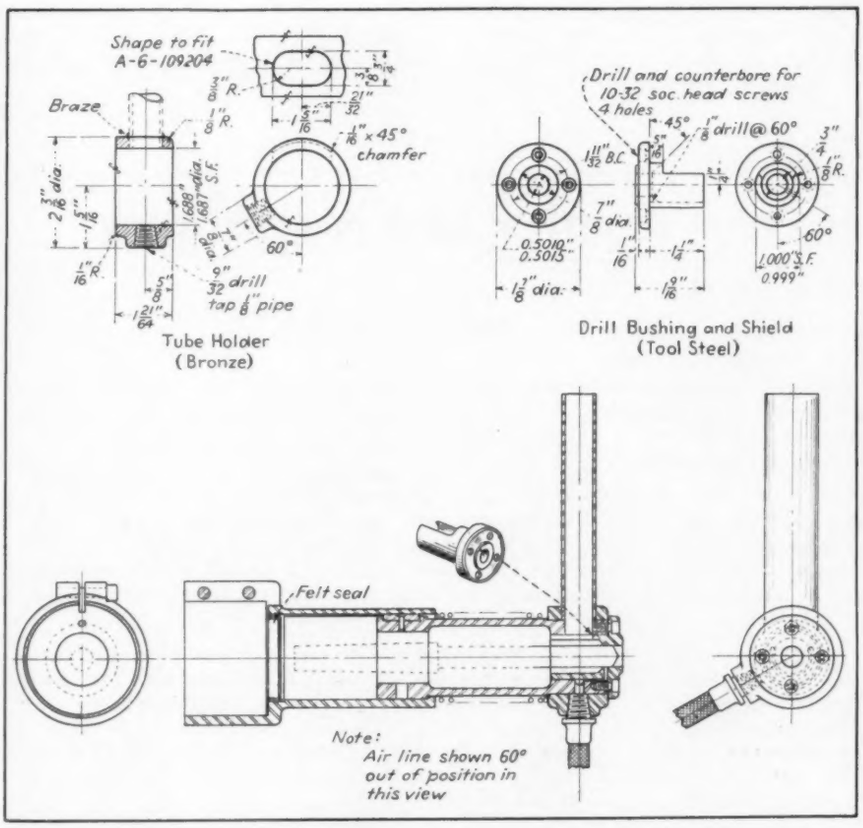
To set the clamp, the three leveling screws are first adjusted and their setscrews tightened. Then, the center bolt is tightened down and the clamp is locked rigidly on the plate.

Chip Remover Operates With Vacuum Air Blast

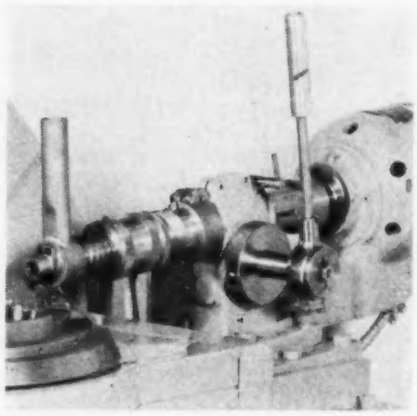
EARL M. LEHIGH

Here is a device which can be adapted to any drilling machine and used on any material which breaks into small chips. A single air jet impinging on a semi-cylindrical baffle creates a rapid flow of air to the large-diameter stack and the low-pressure area behind the baffle creates a suction at the drill bushing which entrains all chips the instant they break from the lips.

The chip remover will work equally well on horizontal or vertical-spindle machines and the stack and air hose can be adjusted to any convenient position. The stack length doesn't matter, but it is better not to aim it directly into a container, but rather just over it so the chips will fall by gravity while the air blast goes harmlessly by. If desired, the air valve can be coupled to the motor switch, thus controlling the air automatically. as the drill is started and stopped.


Shape to fit A-6-109204
Braze
Tube Holder (Bronze)
Drill and counterbore for 10-32 soc. head screws 4 holes
Drill Bushing and Shield (Tool Steel)
Felt seal
Note: Air line shown 60° out of position in this view

High velocity air creates a vacuum just behind drill bushing which removes all chips as they break from the drill lips



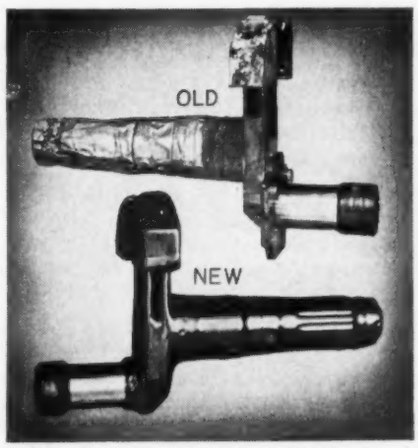
Chip remover as designed for Avey ½ HP drill unit

Plastic Stop-Off Simplifies Quantity Chrome-plating

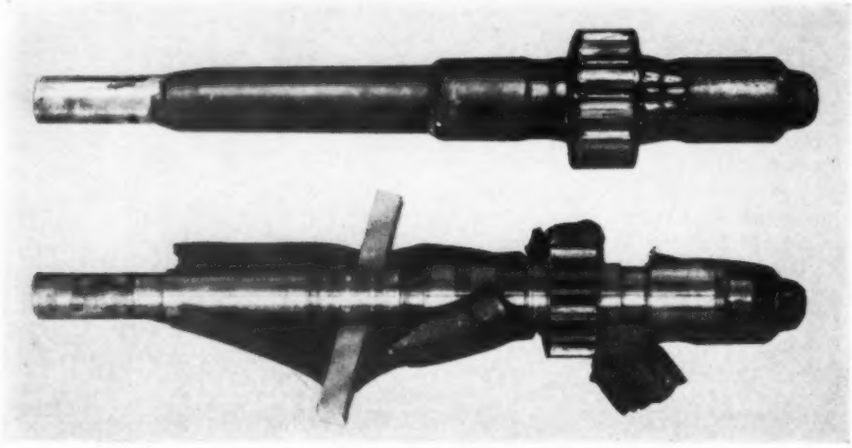
HARRY MURRAY

Cellulose Acetate Butyrate (commercially known as Eronel No. 900 Thermodip) has replaced old-fashioned, slow and sloppy hand-wrapping methods, and demonstrated substantial savings in plating departments throughout the U. S. Navy.

A tank of the liquid plastic, maintained at 300° F., permits instantaneous "wrapping" of any part, regardless of size or shape. When the parts have drained and cooled, there is a hard coating varying from 1/16 to ⅛ in. thick, depending on the temperature of the solution. The coating covers



Comparison of crankshaft prepared for plating by hand-wrapping and with "Thermodip". The former required 3 hr.; now it takes 30 minutes



After plating the teeth on a transmission shaft, the undamaged coating is sliced open, removed and returned to the tank for reuse

the whole part, of course, so the area to be plated is bared simply by cutting with a knife and peeling off the coating. When the plating is complete, the rest of the plastic is ripped off in a moment.

The process is very inexpensive, even disregarding the time-savings, as there is no waste. The plastic is inert chemically and when the coating is removed, it can be remelted and used over and over again indefinitely.

High dielectric strength definitely controls and confines the electrolysis to the desired area, and plating speed itself has been increased by 12%. Plating solutions are thermostatically maintained at 130-140° F.

The average preparation time using Thermodip is one fifth that required for former methods regardless of part size or volume of work.

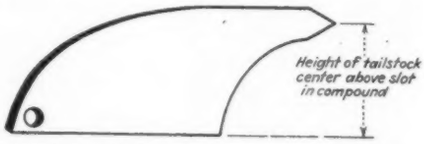
Height Gage Sets Lathe Tools

CHRISTOPHER McGINNIS

Here's a device I made 23 years ago. It has traveled all over the U. S. A. with me, and nowhere have I seen anything like it.

A flat piece of heavy-gage sheet is ground with a finger on one end and flat across the bottom to make the vertical distance equal to the distance from the bottom of the toolpost slot in the compound rest to the point of the tailstock (or headstock) center.

Tool positioning now is much faster. The gage will quickly show the height for dead-center and also provide a reference mark to guess the amount of lead required.



A piece of flat steel, marked to show height of centers, aids in setting lathe tool bits without traversing carriage

NOW... $25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

Until further notice, an extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

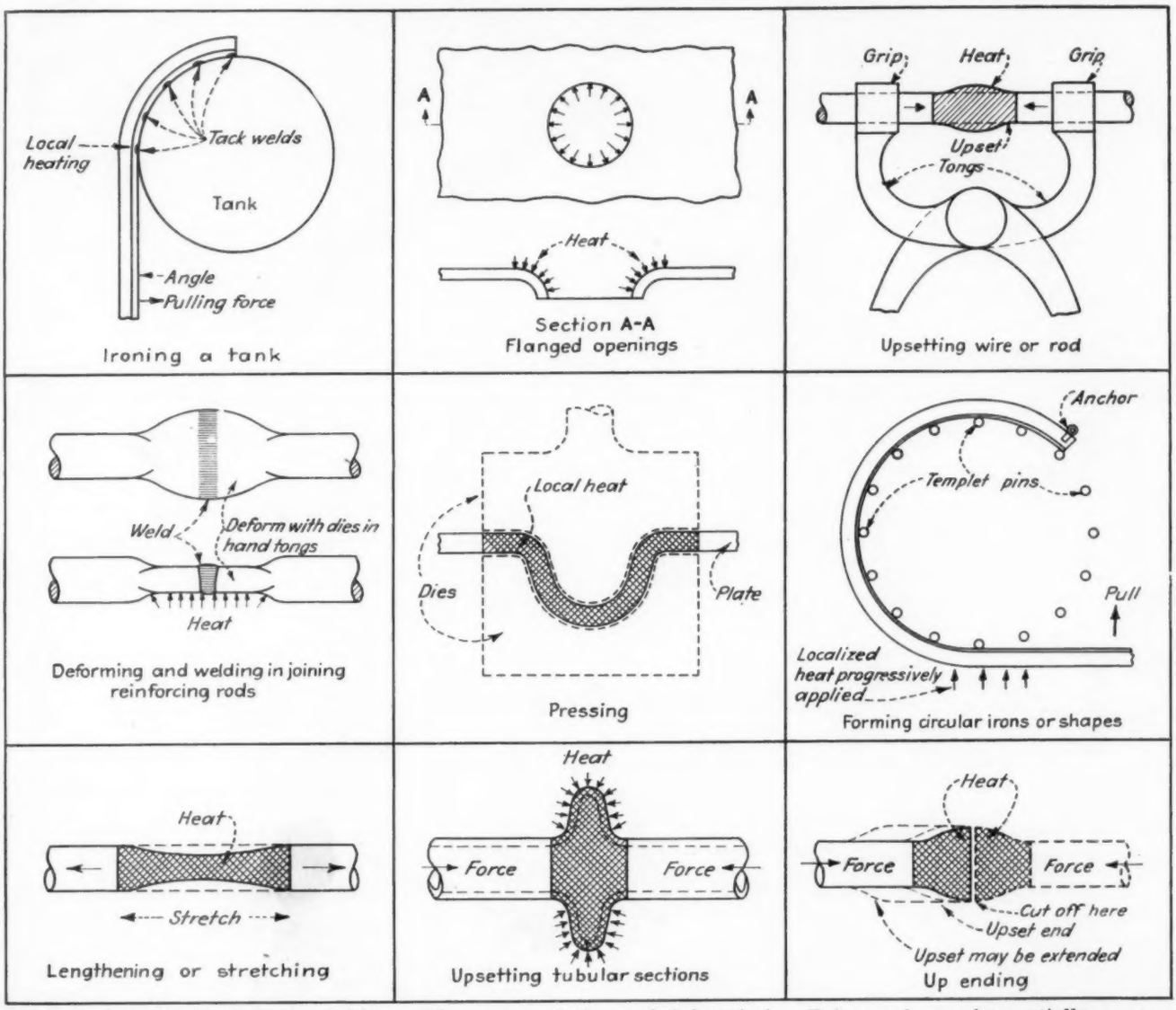
Eighth Selection: L. DeL. Berg's Dividing Head Improvements

American Machinist

REFERENCE BOOK SHEET

Heating for Bending and Straightening

COURTESY THE LINDE AIR PRODUCTS COMPANY



THE INTENSE localized heat of the oxyacetylene flame is an efficient heat source for numerous forging, forming, straightening and pressing operations. A heated section will, upon cooling, attempt to contract to the original size and shape. But if there are forces present to resist expansion, such as other members of the structure or cold metal adjacent to the heated area, expansion will be restrained Then provided the stress from heating exceeds the yield point, the metal will upset, and the cooled length is less than the original length. Sketches show how and where to use the flame to get best results.

Other applications are: Offsets are easily pressed in heavy channel if the metal is heated. A blowpipe anneal of deep-drawing stock, as in auto body work, prevents possible cracking at critical points in the draw or at a sharp corner. Pipe is easily bent to shape after heating, likewise compound bends in structural parts. Tubes ends can be partially or completely closed by flame spinning, or the diameter reduced.

Heat from the oxyacetylene flame is used for forming up plate edges, bending boiler head flanges and forming lapped plates. The fitting of flanges or heads to tanks that are slightly out of round is made easy by heating the deformed section and hammering to shape. Single or multi-flame heads can be used for the various applications mentioned.

IMPROVED PRODUCTION METHODS ARE REFLECTED IN A *PRICE REDUCTION*

Webber was first to discover how to produce gage blocks at comparatively low cost. The achievement enabled thousands of shops to use gage blocks in every phase of inspection and measurement.

An improved finishing process worked out recently enables Webber to announce a price reduction on 84B (84 block set) of interest to every user of gage blocks.

Beginning immediately all 84B units will be listed at $195 f. o. b. Cleveland.

The new price enables hundreds of small shops to further extend the usefulness of block gages as an insurance against spoiled work or a curb on costly controversies with customers. Write for further information.

Carblox (carbide) Wear Gages Extend Life of Gage Blocks

Owners of Webber Gages are urged to save wear on their present sets by the addition .050" and .100" Carblox wear gage sets. Carblox is now made by the same methods used in producing Webber Gages, a synonym for precision in industry.

Webber makes both steel and carbide gage blocks

- ★ Gage Blocks in steps of .00005"
- ★ Heavy Duty Gage Blocks
- ★ Special Size Blocks to Specifications
- ★ Angle Gage Blocks in steps of one second
- ★ Carblox (Carbide) Wear Gages

Webber GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

MAKING GAGE BLOCKS BETTER . . . FOR LESS

Sanding Recommendations for Plastics

Courtesy: Behr-Manning (Div. of Norton Co.) and The Society of Plastics Industry, Inc.

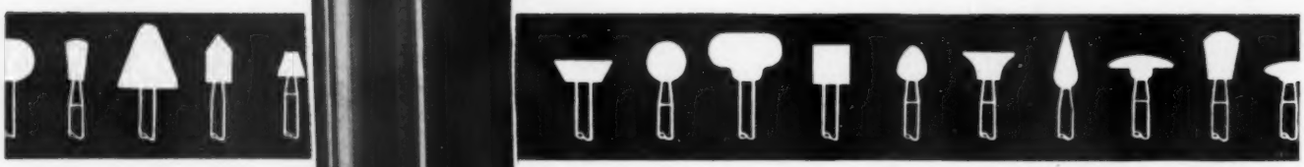
Trade Name	Class Index	Family Type		Class	Rating Basis: 100 = Best; 60 = Suitable					Sanding Recommendations
					Impact Strength	Water Resistance	Solvent Resistance (Cleaners, etc.)	Heat Resistance	Precautions	
AMEROID	17	THERMOSETTING	PHENOLIC	Class 1 Cast Resin	70 Hard-Rigid	90	100	80 Hardens and Checks	Surface Darkens and Discolors on Aging	**Thermosetting Group** Method—Dry Coated Abrasive Abrasive—Silicon Carbide Abrasive Bond—Glue Equipment—Belt, Drum, Spindle, Disk Sanders Operation—Gate and Flash Removal, Surfacing Grit Nos.— Rough—80-100-120 Pre-Buff— 180-220 Finish— 320-400 Coating—Open or Closed Speeds—2500-3500 sfpm. Do Not Burn Remarks—Provide Adequate Dust-removal Facilities
BAKELITE, P. F.	2									
BAKELITE, P. F.—Cast	1									
BAKELITE, U. F.	4									
BAKELITE, Polystyrene	13			Class 2 Molded Compound	70 Hard-Rigid	80	100	100 (250 to 400F.)		
BEETLE	4									
CATALIN	1									
CELLULOID	8			Class 3 Laminated	100 Hard-Tough	90	100	100 (250 to 400F.)	—	
CELORON	3									
CEREX	13									
CHEMACO	9			Class 4 Molded Ureas	60 Hard-Rigid	60	100	80 (170F.)	Sensitive to Water and Heat	
CO-RO-LITE	2									
DAYSTROM	7									
DILECTO	3		AMINO	Class 5 Molded Melamines	70 Hard-Rigid	90	100	90 (210F.)	—	
DUREZ	2									
DURITE	2									
FARLITE	7									
FIBESTOS	9			Class 6 Laminated Translucent Ureas or Melamines	70 Hard-Rigid	80	100	90 (160 to 200F.)	Some Grades Sensitive to Heat Above 160F.	
FORMICA	3									
FORMICA (Translucent)	6									
FORMICA (Opaque)	7									
INDUR	2			Class 7 Laminated Opaque Ureas or Melamines	90 Hard Surface	90	100	90 (220F.)	—	
INSUROK	2									
INSUROK	3									
LAMICOID	3									
LAMICOID	6									
LOALIN	13	THERMOPLASTIC	CELLULOSIC	Class 8 Cellulose Nitrate	100 Tough-Resilient	90	90 Avoid Strong Alcohol	60 (160F.) Combustible	Burns Vigorously When Ignited	**Thermoplastic Group** Method—Wet* Coated Abrasive Abrasive—Silicon Carbide Abrasive Bond—Waterproof Phenolic Resin Equipment—Belt Sanders Operation—Gate and Flash Removal, Surfacing Grit Nos.— Rough—80-100-120 Pre-Buff— 180-220 Finish— 320-400 Coating—Closed Speeds—2500-3500 sfpm. *Thermoplastics flow or gum at approximately 180F.; hence a coolant is required. For either type of plastics mold luster can be restored to sanded area, by buffing with a soft, open type cotton wheel and use of colored buffing waxes.
LUCITE	12									
LUMARITH	9									
LUMARITH, E. C.	11			Class 9 Cellulose Acetate	90 Tough-Resilient	70	80 Avoid Alcohol and Paint Remover	80 (135 to 170F.)	Slight Shrinkage or Warping on Aging of the Softer Compounds	
LUSTRON	13									
MAKALOT	2									
MARBLETTE	1									
MELMAC	5			Class 10 Cellulose Acetate Butyrate	90 Tough-Resilient	80	70 Avoid Alcohol and Paint Remover	80 (135 to 170F.)	—	
MICARTA	3									
MICARTA	7									
NEILLITE	2									
NITRON	8									
NIXON, E. C.	11			Class 11 Ethyl Cellulose	100 Tough-Resilient	80	50 Avoid Oils, Fats, Turps, Cleaners, Alcohol	80 (135 to 180F.)	Sensitive to Oils, Fats and Solvents	
NIXONITE	9									
NIXONOID	8									
NYLON	16									
PANELYTE	3		ACRYLIC	Class 12 Acrylics	70 Tough-Rigid	100	90 Avoid Paint Removers and Strong Alcohol	90 170 to 200 F. Some Types Withstand 225F.	—	
PANELYTE	7									
PARKWOOD	7									
PHENOLITE	3									
PLASKON	4									
PLASKON	5		STYRENE	Class 13 Polystyrene	70 Hard-Rigid	100	60 Avoid Paint Remover Cleaners	80 Certain Types Withstand Over 212F.	—	
PLASTACELE	9									
PLEXIGLAS	12									
PRYSTAL	1									
PYRALIN	8		VINYL	Class 14 Vinyl Chloride Acetate	80 Tough-Rigid	100	90 Avoid Paint Remover and Carbon Tet.	70 (130 to 145F.)	—	
REALWOOD	7									
RESIMENE	5									
RESINOX	2									
SARAN	15									
SPAULDITE	3			Class 15 Vinylidene Chloride	80 Tough-Wiry	100	100	80 (150 to 180F.)	—	
STYRAMIC	13									
STYRON	13									
SYLPLAST	4									
SYNTHANE	3		PROTEIN	Class 16 Polyamide	100 Tough and Elastic-Sinewy	80	100	100 (320F. at Low Load)	Embrittles at Continuous High Temperatures	
TENITE 1	9									
TENITE 2	10									
TEXTOLITE P. F.	2									
TEXTOLITE P. F. Lam.	3									
TEXTOLITE (Translucent)	6			Class 17 Casein	70 Hornlike	50 Absorbs	100	80 (Softens at 250F.)	—	
TEXTOLITE (Opaque)	7									
VINYLITE	14									
VUEPAK	9									

Saves DOLLARS *in close* QUARTERS

For small holes, angles, grooves, corners . . . for all hard to reach places selection of right Mounted Wheels and Points can mean dollars saved in grinding economy. For instance, proper selection may enable you to use one wheel to do the work that two are doing now. Another shape instead of the one you are using may cut costly minutes from your operation.

This economical selection is available to you through Simonds Abrasive Company's line of Mounted Wheels and Points embodying a wide range of shapes and sizes in every required abrasive combination. For precision work or offhand grinding on any type of material from the hardest steel to plastics there is a Simonds Abrasive Wheel or Point to do a better, faster, more economical job for you. Adaptable to all kinds of high speed grinders, these efficient tools run true to form, right down to their stainless steel mandrels.

Simonds Abrasive Mounted Wheels and Points are made to the same high quality, laboratory controlled, scientifically tested standards which govern the manufacture of all Simonds Abrasive Company products.



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Time-honored Borolon and Electrolon Abrasive Products are now distinguished by the name Simonds.

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NEWS OF METALWORKING

All Price Controls are Removed From 50 Types of Machine Tools

WASHINGTON—Forty types of machine tools weighing in excess of 2000 lb. per unit, and ten types of automatic machines regardless of weight, are included in OPA's second big price decontrol order, effective July 26.

The suspension covers industrial machinery and equipment being produced at the rate of $2,000,000,000 per year including, besides machine tools, electrical, oil drilling, mining, testing and maintenance, farm, and other equipment.

Announcing the decontrol, which relieves OPA of arduous price studies, OPA said prices of the freed goods were not expected to rise more than the amount of increases which would have been authorized. Prices of this equipment do not affect the cost of living, nor will the suspension result in diversion of manpower, facilities, or materials from production that might be more important to stabilization.

Reaction is Varied

The first capital goods price decontrol order on April 8, accompanied by a price increase of 20% on machine tools, covered goods selling at an annual total of $3,500,000,000. Some machine tools were included in the April 8 suspension, but they were heavy, specially-designed machines which were very little in demand. One official said it was like "taking the ceiling off giraffe meat."

Some sources say the industry will be very little affected by government price policy from now on, that prices will be made by competition. They point out that very few producers have taken the full 20% price advance already permitted.

OPA spokesmen point out that a large variety of grinders, bench tools, pneumatic drills, electrical tools, and other types are still under ceilings, and that many of these producers may want to go higher than the 20% price relief already afforded. They say they will not be surprised if producers appeal to OPA for suspension of ceilings on units under 2000 lb.

Following are the machine tools decontrolled by the order of July 27:

Machine tools subject to MPR 1 and MPR 67, which with standard equipment weigh in excess of 2,000 lb., including but not restricted to the following: automatics (bar and chucking), bending rolls, boring mills (horizontal and vertical), brakes, broaching machines, bulldozers, cam milling machines, centering machines, chambering machines, chamfering machines, cut-off machines, diamond boring machines, drills (multiple spindle, radial, and sensitive), filing machines, forging hammers, gear cutting and generating machines, grinders (cutter, cylindrical, disc, internal, surface, tool), hammers (power), headers, hobbing machines, honing machines, jig boring machines, keyseating machines, lapping machines, lathes (engine, turret, and special purpose), milling machines (hand, plain, universal, and vertical), nibbling machines, oil grooving machines, planers, polishing and buffing machines, presses (power), profilers, punching machines, screw machines, shapers, sharpening and filing machinery, slotters, swaging machines, tapping machines, threading and thread milling machines.

Machine tools subject to MPR 1 and MPR 67 which operate automatically (regardless of weight), including only the following: automatic screw machines (single and multiple spindle), automatic threading machines (single and multiple spindle), automatic milling machines, automatic chucking machines (vertical or horizontal), automatic cutting-off machines, automatic screw slotting machines, automatic tappers, automatic bolt and screw head trimmers, automatic nut forming machines, automatic turret forming machines.

Non-Ferrous Premium Payments Declared Retroactive to June 30

WASHINGTON—Payments under the recently extended premium price plan for copper, lead, and zinc will be retroactive to June 30, 1945, it has been announced by Reconversion Director John R. Steelman.

At the same time, Mr. Steelman, as Director of Economic Stabilization, directed that approved retroactive wage and salary increase recently granted mine operators be taken into consideration in the payment of premium prices for copper and lead.

Some operators who had not previously received premium payments will become eligible as a result of reduced operating margins. Quotas will be revised where changes in total income of mine operators justify such action.

Under the new price control law as now interpreted, OPA must either remove import price ceilings on copper, lead, zinc, and tin, or fix new import ceilings reflecting world prices. At the same time, the law restores June 30 prices for domestic production. This would set up a two-price system with some consumers forced into the higher-cost import market. Such a situation would render fixing of prices on end products nearly impossible. It is understood that Steelman recognizes this impasse and will try to show that Section 10 of the act does not refer to non-ferrous metals.

Articulated Bus—Built by Kaiser's Permanente magnesium plant near San Jose, Calif., this new motor coach has a body that is 60% magnesium, 40% aluminum. Hand-made at a cost of $150,000 for Santa Fe Trailways, the bus is powered by a specially-built 275 hp. Cummins pancake diesel. With foam-rubber swivel seats and two lavatories, the bus seats 40, would seat 63 with conventional interior. If road tests prove successful Santa Fe plans 15 more, with Kaiser spokesmen predicting the production price at about $30,000

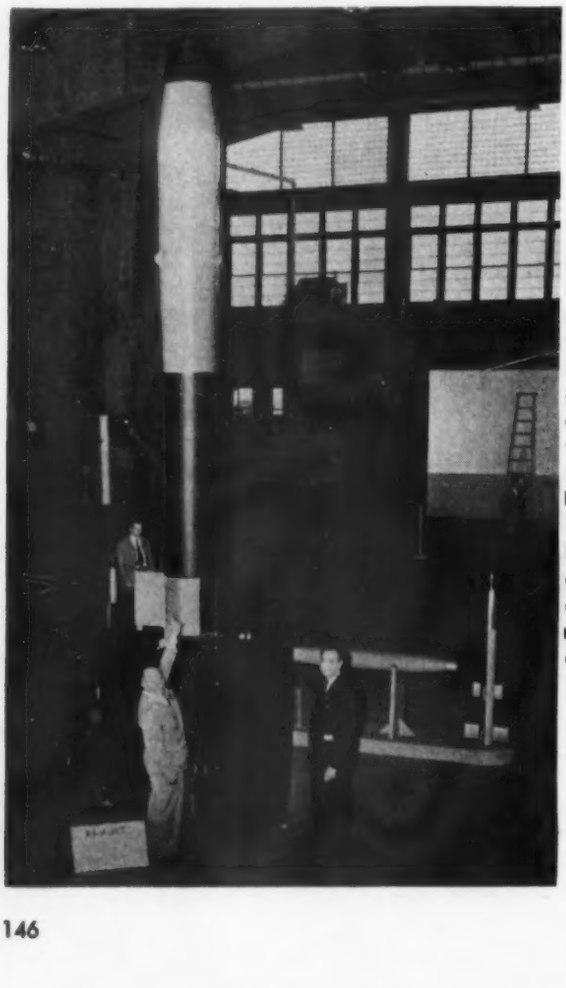
Gaging Business

Production Is Expanding

Though plagued by shortages of materials and parts, metalworking production is expanding. It is doubtful whether activities as gaged by the numbers of workers employed will or can expand much beyond the present level. The growing tightness of the labor situation would not permit it. But output of consumer goods made by metalworking plants will rise sharply as the year progresses and an increase of as much as 60% in volume of production does not seem unreasonable. Pipelines from the factory to the consumer are filling more rapidly than the public appreciates. The result will be a marked gain in the flow of goods into the hands of users in the final quarter of 1946. Strikes would upset this optimistic prediction, but the outlook at the moment is for much fewer labor stoppages the remainder of this year than in the first half.

Both AFL and CIO leaders are wielding their influence on behalf of "staying on the job" and getting out the orders. They feel that this action will contribute considerably toward braking inflation. Preliminary reports indicate that these officials may be content in negotiating for their next wage contract to limit fresh requests to an amount equivalent to the actual rise in the cost-of-living index. With production bound to be steeply up, thus lowering unit costs, employment will expand relatively little. Many companies now have on their payrolls almost as many workers as will be required after production is much higher. Efficiency is expected to rise and hours worked to increase.

Proof that operations are beginning to soar comes from several industries. June factory shipments of washing machines, radios, vacuum cleaners and gas ranges exceeded the prewar record for that month. Electric irons and water heaters are running ahead of the prewar level. Electric ranges are abreast in volume of the output before the war. In July automobile production on a weekly basis got up for the first time since 1941 to a four-million-a-year scale. In the prewar days any year in which four million cars were built was considered a good year.



Laboratory - Developed Ram - Jet Missile — Developed secretly at the Cornell Aerounatical Laboratory, Buffalo, N. Y. for the Navy, this huge ram - jet guided missile is capable of doing 1,300 m.p.h. The development was under the direction of Johns Hopkins University's applied physics laboratory, Washington, D. C. Dr. Clifford C. Furnac, director of the Cornell laboratory, is pointing at the missile, while Dr. G. R. Tatum of Johns Hopkins looks on

Steel Is Limiting Factor

The rate of growth of metalworking production may well be measured by the amount of steel available. Steel will be a limiting factor the rest of this year and probably in 1947, at least during the first half. If Washington makes much use of priorities to force steel into construction projects and into farm implement manufacture, for instance, consumers who use steel in other products will have rough going in acquiring sufficient tonnage to run at the rate which they would like. CPA's resort to priorities on steel will be primarily to break bottlenecks. A consumer may have a substantial supply to cover many operations, but may be short in a few items or sizes. Priority aid would be invoked to help him in such case. Steel company books have not been opened for 1947 business, but already orders have been entered in line pipe, for instance, to take up almost the entire capacity for the year.

Machine Tool Outlook

Machine-tool orders and shipments are believed to have held up well during July, despite vacation shutdowns here and there. New business is coming from a variety of sources, including the automotive industry. Export sales consist mostly of scattered business from many countries — Switzerland, Holland, Belgium, Britain and the Scandinavian countries. Russia, which has been a lucrative market for U. S. machine tools, is holding off placing further orders, possibly until her officials can decide exactly what they wish to pay cash for, since an American loan temporarily is out of consideration. France will buy up to $40,000,000 of U. S. machines if her loan application to the International Bank is granted. Britain's purchases of machine tools and heavy presses are expected to increase sharply as an aftermath to the Anglo-American loan approval by our Congress.

Machine-tool builders face serious problems: shortage of materials and parts, especially motors; dwindling backlogs in certain types of machines partly due to competition from surplus government stocks; and the cost-of-production situation which makes many builders reluctant to quote firm prices beyond the end of this year.

Ship Scrapping Starts

WASHINGTON—About 280 ships will be made available for scrapping, according to the Civilian Production Administration, and will yield 700,000 tons of steel scrap. The scrap is expected to help bolster steel furnace operations.

Detroit Letter

Wage Demand Cycle

The United Auto Workers Union seems to be shifting its strategy line in the wake of a recent C.I.O. board meeting at which it was determined to forego further wage demands unless the cost of living rises most disproportionately. The indication is that the labor leaders are beginning to recognize that wage advances inevitably mean price increases, and that the circle gets higher and more vicious with every turn around it.

This is not to say that wage demands on the auto companies are a current dead letter. Negotiations have been in progress with Chrysler Corp. and Briggs Mfg. Co., to name two large ones, seeking equalizations and reclassifications in rates—moves preliminary to more general wage demands. Such negotiations will not be dropped immediately. But the big push on this score has been delayed before it was fairly begun.

In place of this endeavor, the auto union gave apt indication of its campaign ideas late in July when it sought a meeting with all auto company presidents to discuss means of improving production. This was hoped to be a wedge to open the door on industrywide collective bargaining, a cherished long-term union objective for many years. But rejections of the invitations by auto industry leaders left the idea with a hollow appearance, significant only in that the U.A.W. will be able to say virtuously, "We tried to fix it, but couldn't get any help from management," if, at some future date, labor and strikes are charged with impeding the return to normal production.

Defensive Union Invitation

One other factor, strictly defensive, probably figured in the union invitation. Management explanations of current production lags have uniformly put the blame on supplier plant strikes and pricing programs. The union suggestion for an industrywide conference would serve to eliminate any recriminations which might be visited on top union officialdom by their rank-and-file because there is insufficient work for them.

The fact is that precious little work exists in the auto plants these days, despite modestly increasing production and good-sized payrolls. The latest periodic report of one of the largest companies shows that its employees put in an average of fractionally less than 27 hours a week in the period under analysis. This same company incidentally is doing its share for full employment by maintaining payrolls far above the size which would have been working before the war to turn out its current assembly totals.

Employment Rising

All Detroit's employment is rising. The mid-June index of the Detroit Board of Commerce, in which 1923-25 equals 100, stood at 134.6, the highest for any peacetime year since 1929. The condition is reflecting itself in low unemployment totals, and in intensified demand for people with special skills. Several companies have been using considerable newspaper advertising of late seeking designers, layout men, draftsmen, and other technical help. Responses have been almost nil.

Improved Working Conditions

Unavailability of help and the difficulty of restoring prewar work standards are combining to accelerate thinking on improved factory processes and working conditions.

At Ford, as example, the company's $10,000,000 foundry modernization program, well under way today, is being liberally flavored with the intent of making the production foundry a better place for the workers.

Employee and Technical Innovations

Ford's thinking on employee relations, it should be noted, is advancing most interestingly. One of the buildings in the new Ford engineering and research center, now being started, will be devoted to studying what has become known as "human engineering," since Henry Ford II spoke on that subject early this year. Problems of integrating an individual more satisfactorily into a factory environment—which may move all the way from proper food to the most comfortable floors to stand on—will be treated in this building, which thereby may come to be someting of a landmark in American industrial thinking.

At General Motors, meanwhile, the new technical center, for which the first spadesful of dirt were turned not too long ago, will include a department brand-new to the company, devoted to study of manufacturing methods of all kinds, and of ways to do them better.

In other respects, technical ideas in the auto industry continue to be their aggressive selves. The most intriguing notion now being given a stiff workout in the laboratories is that cold drawn steel can be specified far more closely than in the past. Auto metallurgists are disputing the notion of the steel mills that physical characteristics of cold drawn cannot be specified and standardized. More will likely be heard on this score.

Pre-OPA Shortages Evident

Pre-OPA materials shortages are still in evidence today following the regulation interregnum and the restoration. Cushion spring wire continues a bottleneck; so does pig iron. In addition, the effects of the copper strikes earlier this year are making themselves felt. One large company, seeking to step up its car assembly schedules most materially, is stymied for the moment by inability to place further orders for brass tubing and parts; the requirement of some 50 lb. of copper products on the average car bulks large indeed against shortages which are resulting in quotation by one major producer of December for copper tubing, and as late as next April for brass tubes.

AUTOMOBILE PRODUCTION — 1946

Passenger Cars	Month	Trucks
56,367	January	45,461
57,782	February	35,179
85,810	March	38,160
130,816	April	81,710
168,759	May	76,162
141,090	June	60,812
640,624	6 Month Total	337,484
256,125	July*	111,791
326,637	August*	126,511
344,504	September*	133,717

*July, August and September figures are based on estimates made by the automotive industry for the Civilian Production Administration.

Pacific Coast Industrialists Now Assured of Western Steel Supply

SAN FRANCISCO — What the San Francisco Chamber of Commerce hopes as an indication of things to come for the area's medium-sized metal working shop was evidenced by a recent contract between General Electric and the W. R. Ames Co. Ames will manufacture kitchen cabinets under the arrangement for distribution on the west coast, with production expected to top 1,000 cabinets a week. The company employed about 100 before the war, manufacturing portable irrigation pipe, library book shelves and small jobber items. Their work force doubled in 1941 when orders for aluminum clothes lockers for the navy and steel ammunition boxes for the army took up their production. Now, although returning to prewar products, the GE contract will allow Ames to hold its wartime gains. Industrialists here feel this type of sub-contracting by eastern concerns for western distribution is a transaction in which all parties benefit.

Materials Supply

Tied in closely with this type of development is the western supply of sheet metal which now is assured from Pacific coast sources. Columbia Steel is pushing construction on its $25,000,000 sheet and tin plate mill at Pittsburg, Calif., to ready it for taking the production of Geneva, where Columbia's parent, U. S. Steel, has recently placed blast furnaces, open hearths and coke ovens in operation. Geneva's plate mill will start rolling soon. With Columbia's sheet mill here and others under construction in Seattle and Los Angeles, stock of this material looks good for 1947. So does the sheet aluminum picture. Henry J. Kaiser's Spokane projects are getting underway with the Trentwood rolling mill drawing from a 5,000,000 lb. stockpile, while the Mead reduction plant is expected to make a start soon in producing ingots, with all six pot lines activated by November.

To get the ball rolling, Kaiser signed a wage and working contract with the CIO which will cover both Mead and Trentwood. In it operation workers will get a $1.04 minimum hourly wage with an average of $1.13. It also provides for company checkoff of union dues and seniority rights.

During July, Reynolds Metal took over control of the $19,000,000 aluminum reduction plant at Troutdale, Ore., on a five-year lease from WAA. The huge plant will be producing 142,000,000 lbs. of aluminum per year as soon as Reynolds can get it in operation. With Kaiser's the only aluminum rolling mill in the west, output of Troutdale will have to go east to Reynolds' rolling facilities. No doubt some of its metal will find its way to another Reynolds operation in Phoenix, Ariz., where a lease was recently approved by WAA on a $33,000,000 extrusion plant. With a capacity of 2,750,000 lbs. of extruded shapes and 1,300,000 lbs. of aluminum tubing per month, this Phoenix plant will soon be supplying manufacturers.

Freight Rates May Go Down

Now that the fight to assure local manufacturers a western supply of steel has been won, industrialists are beginning to wonder and worry about how much they will have to pay for it. Big factor in price is the freight rate from Geneva to west coast industrial centers. Fight for a rate that will favor western steel users already has been started by E. G. Plowman, vice president of traffic for U. S. Steel.

With 900,000 tons of semi-finished and finished steel to be hauled annually from Geneva, it is felt here that the railroads will cooperate in making some kind of an equitable freight rate adjustment.

The whole steel picture looks good to the western manufacturer who sees himself buying this vital raw material at a price more favorable to meeting eastern competition than he ever has had before.

Success of OPA Depends on Vigilance; Broad Interpretations of Formulas

WASHINGTON—The Administration is finding ways of making the new price control law more effective than it first appeared to be. Administrator Paul Porter says that renewed vigilance must make up for the statute's weakness. Strong anti-inflation forces will support him, until the act expires automatically next June 30.

Price Control Provisions

Briefly, this is the law, which President Truman signed only because he was convinced Congress would not pass a stronger one at this time:

1: Extends price and wage control to June 30, 1947, and kills OPA on that date.

2: Authorizes a billion dollars for subsidies.

3: Sets up a three-man de-control board.

4: Lays down formulas for setting ceilings, and for decontrol and recontrol. These formulas have been analyzed by the press, but they require intense study in each application.

In a word, all price controls are reinstated by revival of OPA, except those that are specifically suspended since then. Section 18 says the law applies as though it had been extended as of June 30.

Industry will have to show cause why it wants price advances and decontrol, and OPA can interpret the formulas broadly.

OPA has been tough already in ruling that resellers who bought during the price holiday, must sell on the June 30 price basis, although they may charge any higher price which OPA may authorize by August 15.

On deliveries made during the holiday, any price is legal, but "Deliveries made after resumption of price control at prices in excess of seller's ceiling price at time of delivery constitute violation." In general all prices go back to June 30.

60 Days For Action

OPA under the law is required to act on applications within 60 days. Under the formulas, much more data will be necessary. The price agency will do less of the surveying, and the applicant will do more—under a very complicated procedure.

Industries cannot appeal from OPA price decisions. But, if OPA declines to decontrol upon request, the Decontrol Board will accept the appeal. All 685 industry advisory committees are reinstated.

Both OPA and the Decontrol Board are required to remove ceilings from any product whenever the supply exceeds or approximates the demand. Since supply, in these times, could not meet the demand for most products, this provision will result in confusion.

Truck Bookings Up 20%

CHICAGO—Domestic bookings for electric industrial trucks and tractors rose 20% during the month of February, according to the Electric Industrial Truck Association. Total bookings for February came to 282 units valued at $1,164,287 as compared with $930,974 in January.

Washington Bulletin

Exports to Britain

Britain will permit import of many American products, despite the fact her earnings for exports fail to pay for imports. American manufacturers, under Britain's plans following approval of the U. S. loan, can export to the United Kingdom up to 20% by value of their average yearly shipments during 1936-37-38. The British government will grant import licenses on basis of certification by the U.S. Department of Commerce, to which U. S. producers will report their previous average shipment data.

Atomic development will turn into an industry while people are talking about it. Already there is a tussle over appointment by the President of the five-man domestic control commission authorized by the McMahon bill, now law. One suggestion is that the President name, as it stands, the five-man Lilienthal Board which wrote the international control proposal adopted in part by Baruch as the United States policy on United Nations atomic commission.

CPA Report Abolished

The CPA-732 report on metalworking establishments is no longer required by Civilian Production Administration. These establishments include manufacturers of automobiles and consumers' durable goods, as well as producers equipment. CPA will depend upon the reports of other federal agencies for the information. Mr. Small said this ends one of the greatest reporting systems ever undertaken by American industry. At one time, he said, CPA-732 reached 25,000 respondents.

Wage stabilization continues under new OPA but since the Stabilization Board acted only on increases affecting OPA ceilings, its operation will be greatly decreased with many products decontrolled. Speculation is that the President, after a few months, will abolish the Board and let OPA have its limited functions. This possibility is sure to demoralize the Board, beginning now.

Aluminum Topside

Maritime Commission has called for bids on two new 920-foot luxury liners, larger and faster than any ever built in the U. S., for service to Japan. Most of the superstructure, from a point one third aft the bow, will be aluminum—770 tons of it. The light metal on topside will improve stability, permitting narrow beam, and increase speed with less weight. At request of OWMR, Maritime Commission withholds construction of two fast luxury ships for South American trade, and will convert three old ships instead.

With price control back on, CPA will not issue a general order limiting export sales. Instead, a number of items will be added to the "Positive List" under export license control. During the price holiday, export orders skyrocketed, at boom prices. If OPA had stayed dead, goods-hungry foreigners would have outbid U. S. citizens for domestically-scarce products, jeopardizing stabilization. Under OPA, all sales are at ceiling, so the first purchaser for re-sale gets the big profit. Thus the only incentive to export, under price control, is to hold foreign customers.

Union Attitude Changing

AFL and CIO leaders appear to have awakened to the elemental fact that a combination of wage increases and stifled production inevitably will force up prices, OPA notwithstanding. That's why labor's current policy is to go easy on strikes, and watch what happens to the cost of living over the next few months before pressing new wage demands.

These leaders realize that the 18½¢ wage increases obtained since the end of the war have been practically nullified by price increases which followed even before OPA's powers were clipped, and that if the worker's dollar is to mean anything there must be at least an increase in production (if not in productivity) which would reduce costs and prices.

Labor Tighter Soon

Labor will be still tighter by Fall, and industry will be hiring women again. The 2½ million unemployed are said to be in "job transition." Actually many of them are participants of the greatest loafing spree in U. S. history—one of the chief causes of slow production for stabilization. Army discharges are dropping off to about 100,000 per month, and the portion of those men who go to work spreads pretty thin over the whole country.

DECONTROL BOARD NAMED

WASHINGTON—President Truman has named to the important Price Decontrol Board three men who are not crusaders, nor are they inclined to give inflation its head. These men, who will carry the final responsibility for tapering off price control, are Daniel Bell, former Under Secretary of the Treasury, expected to back the administration's effort to keep prices generally stable. George H. Mead, Dayton paper manufacturer, a liberal business man considered too pro-labor to be representative of industry; and as Chairman, Roy L. Thompson, president of the Federal Land Bank of New Orleans and former professor of economics at Louisiana State University.

War Contracts Investigation—Henry Garsson, top official of a munitions making combine under investigation for its war activities by Senate Mead War Investigating Committee, is pictured showing some of the shell parts his firm made under Army Contract, during a recent committee hearing in Washington

Severe Labor Shortage Expected to Hit Chicago Area by Spring

CHICAGO—The most confused labor situation since the wartime shortage is adding another burden to Chicago area metalworking firms, already struggling with problems raised by the revised OPA and by the continuing shortage of many types of materials.

Although reports of various public and private agencies differ, there is general agreement that total employment in the area is now close to the wartime peak. Despite the high level of employment, major manufacturing concerns plan to add 10,000 workers a month to their payrolls for the next four months. On the other hand estimates of unemployed workers in the Chicago area run up to 180,000.

Shortage of Women Workers

While it would appear that more workers are available than jobs, the reverse seems to be the case. Despite heavy lay-offs of women workers at the end of the war, there is now a shortage of many types of female employees. The heavy demands of service industries and for secretarial help have cut into the supply of women available for factory work.

The iron and steel industry and makers of all types of machinery, including electrical, are most in need of additional help. Major shortages exist for mechanical engineers, draftsmen, tool and die makers, sheetmetal workers, inexperienced bench assembly workers and buffers and polishers.

In contrast Chicago employers report that a surplus exists of chemists, general industrial clerks, welders, airplane mechanics, inexperienced machine and craft trainees and truck drivers.

By next Spring at the latest, all authorities agree, Chicago will be in the midst of a severe labor shortage if materials bottlenecks are eliminated. This prospect is getting careful consideration from manufacturers with large-scale expansion plans. They are hoping that war workers and veterans who have been vacationing will be in the mood to resume work by the time the heavy demand for labor arrives.

Capacity Foundry Output

Foundry spokesmen predict that the backlog of demand for castings will keep foundries running at capacity for at least two years, and will sustain a high level of output for at least three additional years, despite the fact that foundry capacity was doubled during the war.

Meanwhile foundries report that the years of labor shortage which have hampered them are beginning to ease. Improved working conditions plus the return of veterans who were drafted from foundries account for the improvement in labor supply. The pig iron shortage, however, a hangover from the steel and coal strikes, is giving the foundrymen considerable trouble.

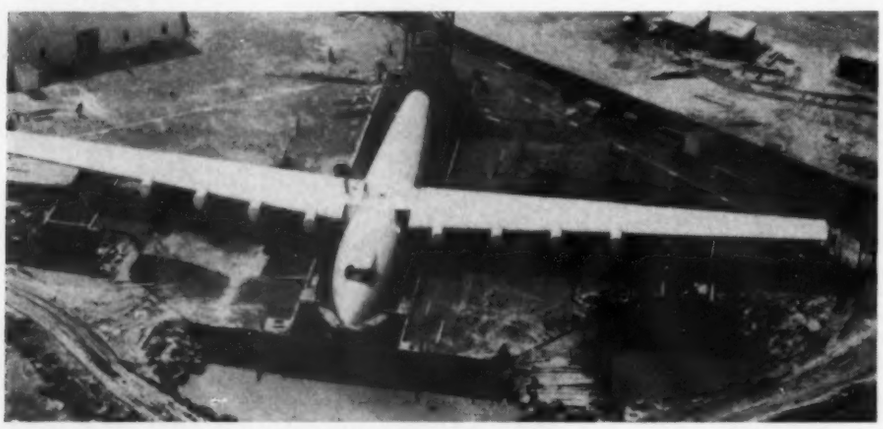
The increased use of precision castings, reported by foundrymen, ties in with a number of other developments indicating that manufacturers are wasting no time in introducing production methods that step up output without increasing labor costs. Precision castings in many cases more than repay their additional cost by eliminating machining.

Other developments in this same direction reported by Chicago area manufacturers are these:

Accelerated use of resistance welding for many mass produced items such as refrigerators, stoves, and washing machines.

Improved materials handling methods, with a trend to more conveyors and widespread use of pallets.

Addition of complicated electrical controls to many machines that perform operations in sequence, cutting down the amount of skilled labor required. In general, manufacturers say that there has been little union resistance to labor saving devices as long as the tasks of the workers are eased at the same time.



World's Largest Flying Boat—The Hughes flying boat at a Los Angeles, Calif., graving dock along the waterfront, as seen from overhead. The wing, 320 ft. long, is shown joined to the fuselage, while work on the tail assembly is still underway

Surplus Machine Tool Disposal Causes Policy Clashes in WAA

NEW YORK—With only 10 to 20% of the standard general-purpose machine tools to be disposed of by the government still to be declared surplus, WAA officials are clashing over the best disposal policy to be followed.

Despite these optimistic figures, WAA admits that its records are incomplete. A considerable number of machine tools have gone into depots and warehouses without being recorded, and no one will venture a guess as to the amount. One WAA official says he is trying to find out from machine tool builders their war shipment figures in an attempt to arrive at surplus conclusions.

Plans Are Debated

Among the proposals being debated is one to try to get private manufacturers with disposal surplus machine tools to sell them through WAA. If this were done, chances of low-price auction-sale competition would be reduced. Another is to sell surplus machines to schools at a nominal price. Objectors say the machines that schools need are in short supply, that production machines available are not adapted to training.

One of WAA's troubles is that its own salesmen, in the main, do not know machine tools. It is impossible for them to do a good job of selling an unfamiliar product. WAA acknowledges this to be true.

Most of the remaining machine tools are in a limited number of large plants and are largely of special designs that will not be wanted by outside buyers. Surplus sales will run into increasing competition from the much improved, more highly productive new machines introduced by machine-tool builders.

Price Increase In Pig Iron Allowed Under New OPA Ruling

PITTSBURGH—A revised OPA permitted a $2 per ton increase in pig iron, but there are no indications that any other price adjustments in basic steel products are in the offing. The OPA took a sideline position in regard to scrap prices which, in effect, means that while there will be no increase now, the future must be considered an uncertain quantity.

In some quarters, the refusal to allow a scrap increase was construed to mean there would be no steel price increases. The pig iron increase was aimed to benefit merchant producers of pig iron rather than integrated steel makers.

Eugene G. Grace, Bethlehem Steel president, predicted accurately that an increase in pig iron prices would precede a selective price advance in steel products. This prediction serves to remind that there are constant complaints about the price levels of some products, including wire products, reinforcing bars and a few other coated commodities where levels in non-ferrous items have forced up costs in more recent periods.

Steel Slightly Improved

If there has been any change in the steel supply picture, it must balance on the side of modest improvement. Finished steel operations were at an excellent level during July and in view of the extreme care in the taking of new business it is believed the considerable backlogs were reduced.

The quota system in some items, notably flat-rolled products, was difficult to maintain in view of the priorities accorded to producers of housing materials, farm implements and warehouses, but it is believed automobile manufacturers, as one class of consumer, did not suffer unduly. About 20% of all the light-flat rolled made is moving out under priorities. The item burdened heaviest in this manner is galvanized sheets.

One of the strange quirks of the industry is that congestion has multiplied in plates. This is due to a combination of small steel allocations to such mills, claims of poor returns on ordinary grades and an increasing demand. Part of this latter develops from much larger needs of railroad car builders, tank manufacturers and pipe makers.

New Die Casting Plant

DES PLANES, ILL. — Aluminum Co. of America has applied to CPA for permission to erect a plant here for the manufacture of aluminum die castings. The plant would include manufacturing, service and office buildings and would relieve Alcoa's present die casting facilities at Garwood, N. J.

Names in the News

Robert W. Ward

Edward J. Towey

Robert W. Ward has been elected vice president in charge of manufacturing for the American Car and Foundry Co. with headquarters in New York. He was previously district manager of the Huntington, W. Va. plant and has been succeeded there by **W. E. Lunger.**

Edward J. Towey has been appointed sales manager of the Industrial Div. of Adel Precision Products Corp., Burbank, Calif. He was formerly executive vice president of the Diamond Iron Works, Minneapolis, Minn.

Everett B. Evleth has been named president of the Ray Control Co., Pasadena, Calif. For the past eight and one-half years he has been vice president and general manager of the Brown Instrument Co., Philadelphia and prior to that he served as vice president in charge of the middle west sales zone for Minneapolis-Honeywell Co.

P. D. Scott has been appointed general sales manager of the Alloy Rods Co., York, Pa.

Charles Collins and **T. A. Button** have been named vice presidents of the Geroter May Corp., Baltimore, Md. Mr. Collins will be in charge of sales and advertising, while Mr. Button will be in charge of production.

Don H. Proctor has been appointed chief sales engineer for the Lovejoy Tool Co., Inc., Springfield, Vt. Mr. Proctor has been with the company 28 years and for the past six years he has sold exclusively in the New England area.

William Rodder, formerly chief engineer, has been named director of engineering of The Aetna-Standard Engineering Co., Youngstown, Ohio.

D. A. Cameron has been appointed assistant general sales manager of The Parker Appliance Co., Cleveland.

Harold E. Joy has been named assistant purchasing agent of the Ford Motor Co. He was previously with the Dodge Div., Chrysler Corp., where he has held various executive positions in the purchasing, production and planning divisions since 1919.

C. J. Parker has succeeded **E. J. Norton** as manager of the Pottstown plant of the Spicer Manufacturing Div. of Dana Corp.

George S. Cole, Jr., factory manager at the Brown-Lipe-Chapin Div., General Motors Corp. in Syracuse, N. Y., has been placed in charge of General Motors new Elyria, Ohio plant.

John E. Lynch

John E. Lynch, for 14 years manager of the Cincinnati sales office of Cincinnati Milling and Grinding Machines, Inc., was recently named manager of the New York office. At the same time, **Carl M. Beach** was named manager of the Detroit office, while **E. F. Render** was moved to Detroit and **W. Kent Mathias** to the Syracuse, N. Y. office.

Henry A. Mullen has been appointed manager of resistance welding sales for Ampco Metal, Inc., Milwaukee, Wis.

H. V. Wright, former service manager for Canadian Wright, Ltd., has been named president and director of the Canadian licensee of Wright Aeronautical Corp. following a recent reorganization. Also, **J. A. Limoges** has become vice president, treasurer and director.

Lt. Comdr. William R. Bowen has returned to Farrel-Birmingham, Inc. as manager of the company's branch sales office at Akron, Ohio. He succeeds **Harry D. Temporal,** who will manage the firm's Chicago office.

Emil Kern has been appointed chief engineer of the Allegheny Ludlum Steel Corp. with headquarters in Brackenridge, Pa.

Harry S. Gibbard has joined Norman Products Co., Inc., Cleveland, as chief engineer.

Carl L. Frederick has assumed his new duties as vice president of Frederic Flader, Inc., Buffalo, N. Y.

BUSINESS ITEMS

Superior Engine Div., The National Supply Co., has moved its branch office in Washington, D. C. to the Tucker Bldg., 411 S. Paca St., Baltimore, Md. **J. P. Hill,** Washington manager, will continue in charge in Baltimore.

H. K. Porter Co., Inc., Pittsburgh, has purchased the **American Spiral Spring & Manufacturing Co.,** Pittsburgh. The new acquisition, together with the present Porter Fort Pitt Spring plant, will be operated as **American-Fort Pitt Spring Div., H. K. Porter Co., Inc.**

P. R. Mallory & Co., Inc., Indianapolis, Ind., has opened a new branch plant at 8605 Livernois Ave., Detroit, for the manufacture of special resistance welding dies, electrodes, and allied welding parts. The staff at the plant is headed by **A. O. Braun,** district manager.

Lincoln Park Industries, Lincoln Park, Mich., has formed a new department for the manufacture of carbide dies.

Voss Machinery Co., 2882 West Liberty Ave., Pittsburgh, has been appointed distributors for the **Ferracute Machine Co.,** Bridgeton, N. J. in western Pa., W. Va., eastern Ohio and western Md.

The Keystone Abrasive Wheel, Inc., Carnegie, Pa. has recently opened two branch offices. The one in Philadelphia, under the direction of **B. L. Schaefer,** is located at 1500 Walnut St., while the Detroit office with **Edward B. Caulkin, Jr.,** in charge, is in the Guardian Bldg.

Rogers Diesel and Aircraft Corp., New York City, has changed its name to **R. B. Rogers Companies, Inc.**

Hyster Co. is now operating its new plant in Danville, Ill., under the direct management of **Frank L. Ross,** vice president in charge of eastern activities.

The Denison Engineering Co., Columbus, Ohio, has appointed the following three companies as exclusive dealers: **The Briggs-Weaver Machinery Co.,** 309 N. Market St., Dallas, Texas, to cover northern Texas, N. M., and western Okla.; **The Noland Co.,** 115 Market St., Chattanooga, Tenn. in Ala., Ga. and part of Tenn.; **The B. & W. Machine Co., Inc.,** 241 N. Gray Ave., Indianapolis, Ind. for the southern portion of Ind. and western Ky.

Moore Products Co., Philadelphia, has opened a branch office for northern Ill., northern Ind., Wis., and eastern Iowa, at 105 W. Monroe Bldg., Chicago.

The B. C. Ames Co., Waltham, Mass., has sold its manufacturing rights in Ames bench lathes, milling machines and hardness testers to the **Ames Precision Machine Works,** Waltham. Concurrently, the B. C. Ames Co. has been reorganized and **Warren Ames** has been named president and **H. G. Haynes,** treasurer.

Benjamin Electric Mfg. Co., Des Plaines, Ill. has opened a modern product development and testing laboratory.

Allis-Chalmers Mfg. Co., Milwaukee Wis., has opened a branch office in the Claremount Hotel Bldg., Evansville, Ind., with **R. W. Gillmore** as manager.

The Parker Appliance Co., Cleveland, has formed a Pacific division of the company of which **Harvey E. Schroeder,** formerly district sales manager in Los Angeles, will be manager.

The John S. Barnes Corp., Rockford, Ill., has appointed the **George M. Pearse Co.,** 965 Broad St., Newark, N. J. as its sales representative in the metropolitan New York and Newark area.

OBITUARIES

Ellsworth M. Rust, 67, vice president of The Rust Engineering Co., died at his home July 24. He and his two brothers formed the company in 1905 and he has served as vice president ever since.

A. E. Lindberg, who had been chief engineer of the Moline Tool Co., Moline, Ill., for 25 years prior to his retirement in 1944, passed away July 17. Mr. Lindberg became associated with the company in 1910 and was named chief engineer in 1919.

Russell A. Cannon, former vice president of the Birdsboro Steel Foundry and Machine Co., Reading, Pa. passed away recently. Upon his retirement more than a year ago, he was appointed consultant to the president of the company.

Albert D. Pedrick, 81, inventor and co-founder of the Pedrick Tool and Machine Co., Philadelphia, Pa., died July 18.

William P. Newman, who retired July 1 as purchasing agent of Robins Conveyors, Inc., passed away July 17. He joined Robins in 1899 and for the past 25 years had been purchasing agent.

John C. Warne, 91, former general manager of the National Car Wheel Co., Pittsburgh, died July 16.

Clarence C. Keehn, 67, former president, general manager and treasurer of the Lusk Manufacturing Co., Ltd., Canandaigua, N. Y., died July 16.

Emil H. Bergens, 76, who retired as president of the Acme Pattern & Machine Co., Inc., Buffalo, N. Y. in 1929, passed away July 22.

Angelo Volpe, 63, president of the State Plating Co., Rochester, N. Y., which he founded seven years ago, passed away July 12.

John B. Barry, 54, who recently resigned after serving for three years as vice president of Designers for Industry, Inc., Cleveland, died July 17.

William H. Snyder, 56, purchasing agent for the Republic Steel Corp. and its predecessors for the past 32 years, passed away July 16.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel, Chicago, Ill. Oct. 28-30. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Machine Tool Distributors' Association. Fall meeting. The Homestead, Hot Springs, Va. Sept. 18-19. Thomas A. Fernley, Jr., executive secretary, 505 Arch St., Philadephia 6, Pa.

American Society of Body Engineers. Technical Convention. Rackham Memorial Bldg., Detroit, Mich. Oct. 23-25. Carl W. Cenzer, chairman, 100 Farnsworth Ave., Detroit, Mich.

American Society of Mechanical Engineers. Fall meeting. Hotel Statler, Boston, Mass. Sept. 30-Oct. 3. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

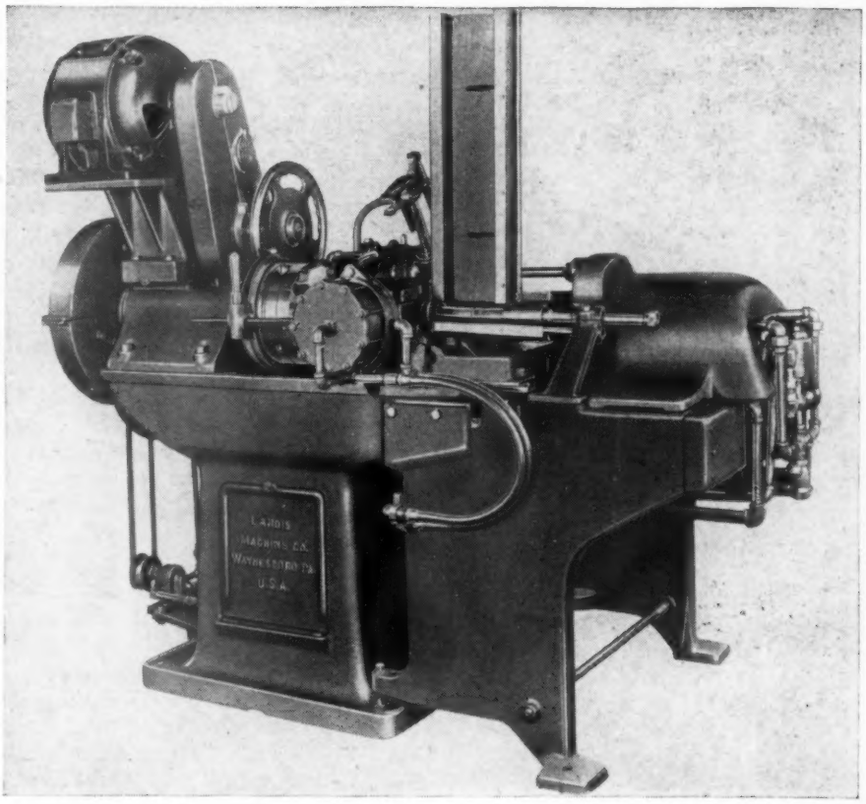
Instrument Society of America. National instrument conference and exhibit. William Penn Hotel, Pittsburgh, Pa. Sept. 16-20. Richard Rimbach, executive secretary, 1117 Wolfendale Ave., Pittsburgh 12, Pa.

National Association of Foremen. Annual Convention. Kiel Auditorium, St. Louis, Mo. Sept. 12-14. Convention Headquarters, Forest Park Hotel, St. Louis, Mo.

National Electronics Conference. Edgewater Beach Hotel, Chicago, Ill. Oct. 3-5. C. A. Emery, chairman publicity committee, 20 No. Wacker Dr., Chicago 6, Ill.

Shop Equipment News

Landis Automatic Nipple Machine Threads, Reams, Chamfers Both Ends



Pipe nipples are automatically threaded, reamed, and chamfered first on one end and then on the other in the two carriages of this automatic nipple machine

An automatic nipple machine which threads, reams, and chamfers both ends of space nipples has been developed by Landis Machine Co., Waynesboro, Pa. The two sizes built are the 1¼-in. machine for ½-, ¾-, or 1-in. pipe sizes, and the 2-in. machine for 1-, 1¼-, 1½-, or 2-in. pipe sizes.

Two spindles are each equipped with Lanco internal-trip semi-receding pipe and nipple threading diehead and reaming attachments. The two carriages have air-operated vises for gripping the nipples and the left-hand carriage carries an adjustable magazine from which the nipple blanks are automatically fed into the machine.

Nipple blanks of desired length are placed in the magazine on the left-hand carriage. The nipple being loaded is pushed into position in the grips and the air vise closes. The left-hand carriage advances rapidly to thread-cutting position and then at feed rate produces the desired lead. Carriage movement is controlled by an accurately machined cam.

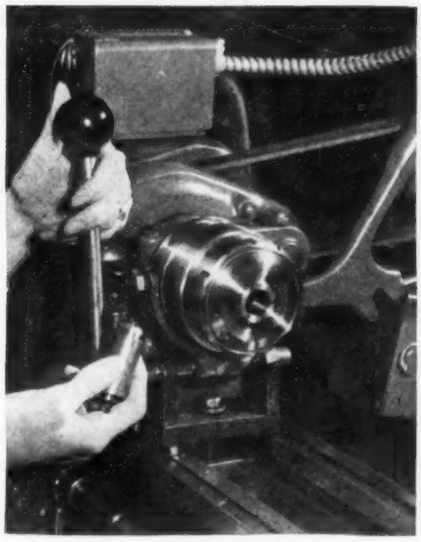
When the thread is cut and chamfering and reaming are completed, the diehead and air vise open and the carriage returns to loading position. A transfer mechanism removes the blank, turns it end for end and places it in loading position for the right-hand carriage where the same cycle is repeated. The entire operation is automatic.

Change gears give required spindle speeds from the constant-speed motor. A safety clutch built into the drive prevents serious damage if a jam occurs.

The 1¼-in. machine can be equipped to handle any one diameter of pipe or with combination equipment to handle both the ½- and ¾-in. pipe sizes. Nipples 2 to 6 in. in length can be handled, except for the 1-in. pipe size which must be at least 2½-in. long.

The 2-in. machine will handle any one size, or with combination equipment will take either the 1- and 1¼-in. sizes or the 1½- and 2-in. sizes. Lengths handled are 2½ to 6 in. on the 1-in. size, and 3 to 6 in. on the larger sizes.

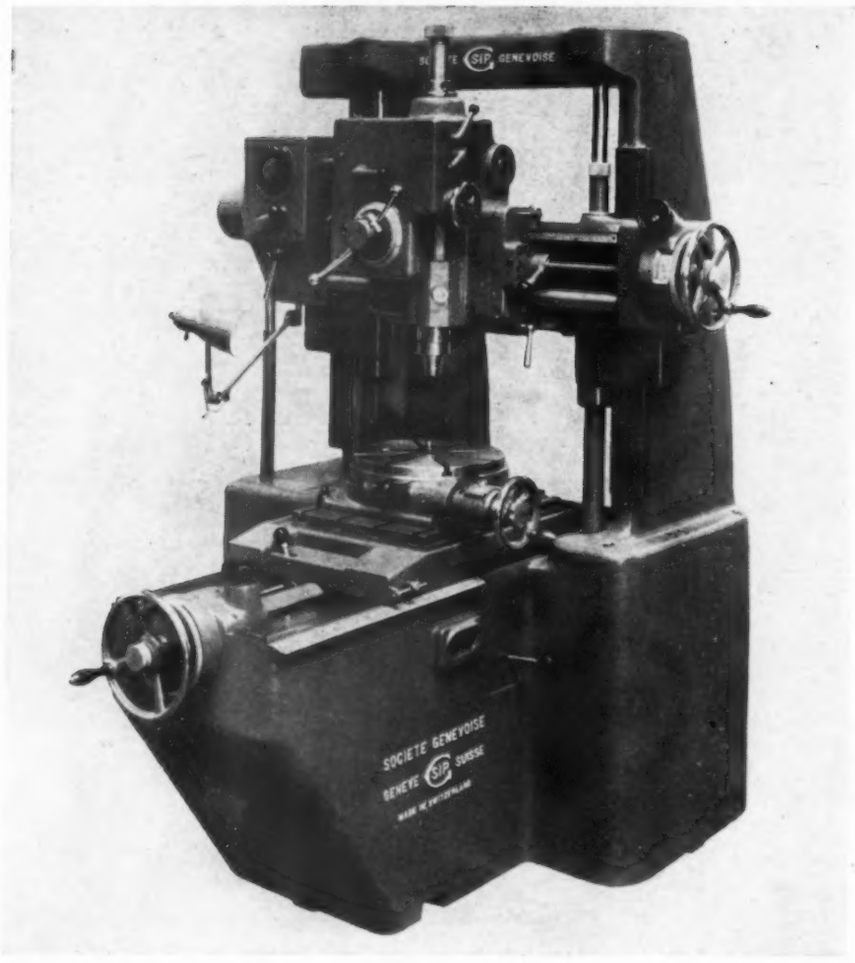
Goodwin Collet Chuck Has Quick-Acting Lever Control



A collet chuck controlled by a short lever is announced by Goodwin Mfg. Co., 1743 Second Ave., Cuyahoga Falls, Ohio. This quick-acting chuck requires only fingertip force to open or close the collet.

The threaded nose cap can be removed for changing collets or turned to adjust collet gripping pressure and locked in proper adjustment. The adapter plate is threaded to fit the spindle or can be supplied with a straight or tapered hole. Cantilever action of the hardened steel fingers is said to provide a powerful grip.

Cosa SIP Jig Borer of Planer Type Makes Direct Reading of 0.00005 in.



Direct readings are made on the Type 3K jig borer to 0.00005 in. The machine can also be used as a measuring instrument

A new SIP jig borer of the planer type, Type 3K, is announced by Cosa Corporation, 405 Lexington Ave., New York, N. Y. Made by Societe Genevoise D'Instruments de Physique of Geneva, Switzerland, the borer has a table working surface 20½ x 15 in.

Measuring screws and micrometer heads are built in so that direct readings are made to 0.00005 in. on the verniers of large divided drums. Automatic correctors compensate for any source of error in the measuring devices, and there is a guaranteed accuracy for all settings of the work table and spindle saddle of 0.0002 in.

Eight spindle speeds ranging from 75 to 2,000 rpm., and six automatic feeds in either direction are available. The crossrail is traversed vertically by a motor driving two strong elevating screws of high precision for accurate horizontal positioning. These screws extend downward into the bed and are lubricated by oil baths. A special guiding arm is supplied to facilitate machining of small holes. A depth-measuring device can be mounted like the guiding arm on the spindle head to limit the boring head. The depth-measuring device can be used either as a sliding caliper or a comparator.

Slide Rules Have Compact Data For Use in Gage Design Work

A set of slide rules for gage design has been developed at the Frankford Arsenal Gage Laboratory by Benjamin B. Patton, John Longworth and Willard R. Nary. Copyrights on the gages have been assigned to the Ordnance Department and requests for permission to use them should be addressed to Office, Chief of Ordnance, Washington 25, D. C.

Two of these slide rules are for the design of plain gages, such as plug, ring, and snap gages, adjustable length and flush pin gages. One of these is circular and the other rectangular. The designer need only have component tolerance and size for determination of gage size, wear allowance, and gage tolerance. This compact arrangement of engineering data is said to have improved both the quantity and quality of gage design at Frankford Arsenal.

A slide rule for the design of thread gages enables the gage designer to obtain the data necessary for the design of thread plugs, thread rings, and setting plugs for National Special Threads. Given the data as to the dimensions of special threads, the designer can completely design a set of thread gages.

Master Horizontal Grinders Use Light Magnesium Housing

A line of horizontal grinders which includes eight models is announced by the Master Pneumatic Tool Co., Inc., 2100 Keith Bldg., Cleveland, Ohio. Made in 4- to 8-inch sizes, for light- and heavy-duty, they have hard chrome used on the main wear-

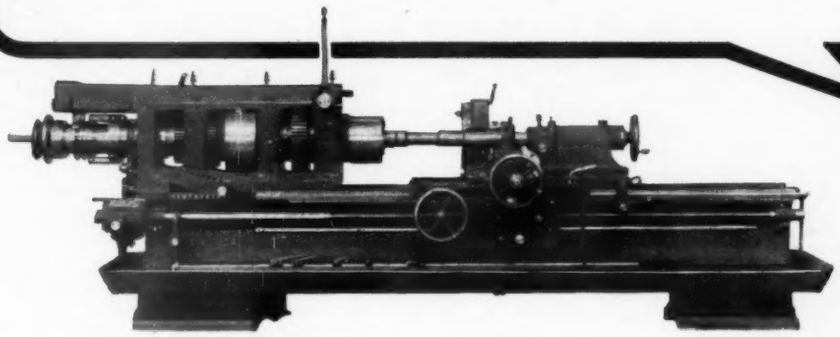
The housing is made of magnesium for light weight. A quick-acting governor maintains correct load and free speeds regardless of fluctuating air pressure. Illustrated is the M-604 straight-handle 4-in. grinder.

Westcott Light-Duty Chucks Fit Lathe Spindle Directly

Light - duty chucks which are threaded to fit directly on the spindle of several popular lathes are made by Westcott Chuck Co., Oneida, N. Y. The chuck will fit lathes having 1½-in., 8-thread spindles without the use of an adapter plate.

The Style 6900 universal chucks are made in 5- and 6-in. sizes. Style 5900 independent chucks are made in the 6-in. size.

YOU MAY *Patch Up* THIS "OLD TIMER" . . . BUT CAN YOU *Catch Up* WITH TODAY'S PRODUCTION DEMANDS?



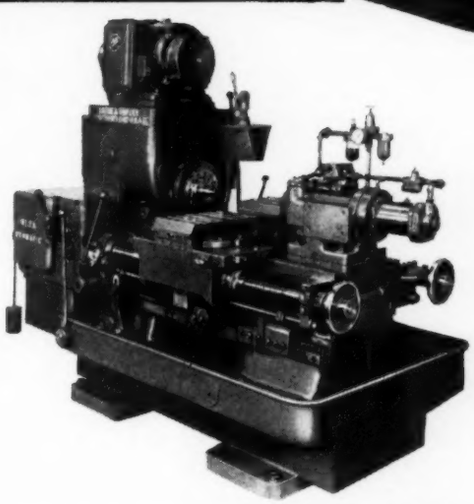
● Your "old-time" lathe may have done a job for years . . . and you may coax some kind of production out of it for sometime to come. You may patch it up . . . replace the worn-out parts with new parts . . . refit worn sliding surfaces . . . but you haven't added any horsepower. All you have done is to correct known inaccuracies.

You might even install an individual motor drive over the cone head drive . . . then discover you can't transmit greater horsepower or obtain sufficient speeds to meet present-day machining requirements.

It all adds up to one sound conclusion —the lathe is still an old lathe! It's profit possibilities are not much greater after costly repairs and alterations. In horsepower and rigidity it's still far below the standards required for profitable high speed, modern tool operation.

So before you "patch up", check all the many advantages offered by new Lodge & Shipley Lathes—they're so modern that even lathes only a few years old are outmoded by their many new features.

Let an L & S Engineer "sit in" on your lathe problems. He'll be glad to demonstrate these and many other advantages—show you how your own work will cost far less with new L & S Lathes. Write on your company letterhead for condensed catalog on the entire L & S line.



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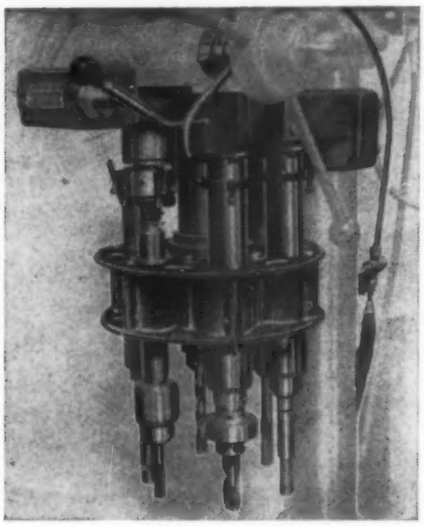
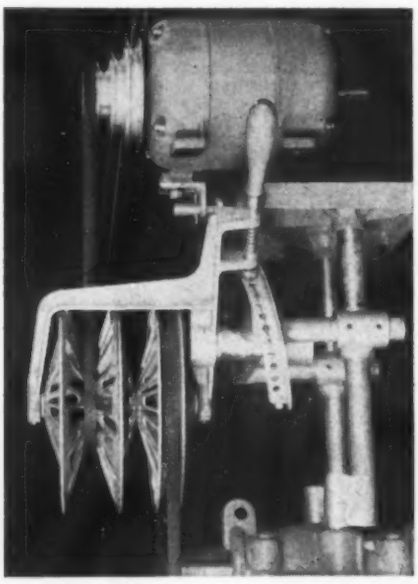
Weaver Drill Press Attachments Include A Six-Spindle Turret

Two new attachments, a multiple-spindle turret and a variable-speed unit for drill presses of 17-in. capacity, are announced by Weaver Corp., San Diego 1, Calif.

The "Multi-6-Spindle" has six vertical spindles. The unit is attached to the drill press column by a simple



cast-iron bracket. All operations which can be performed by the drill press can be done on the spindle, including light boring and lead screw tapping. Up to six different operations can be performed on the same working center without changing setup.



The "Vari-Speed" unit is intended for V-belt driven drill presses. Two telescoping disks increase or decrease the speed ratios between the drill-press motor and the drive as the single hand-lever control is advanced or retarded along the control track. The unit is attached to the drill press motor mount base after relocating the motor on the Vari-Speed mounting plate assembly. Speed variations are obtained while the drill press is in operation.

Solid Kennametal Grooving Tools Permit Longer Run Between Grinds

A line of solid Kennametal grooving-tool blades is produced by Kennametal, Inc., Latrobe, Pa. Many more regrinds are possible than with tools having brazed-on tips.

Rigidity of the blade is said to minimize weaving and give longer

service between grinds on grooving jobs. Production tests are said to have demonstrated that the solid blade grooved 18,000 to 20,000 aluminum alloy pistons before regrinding, whereas the brazed-on tools formerly used had to be reground after cutting grooves in approximately 800 pistons.

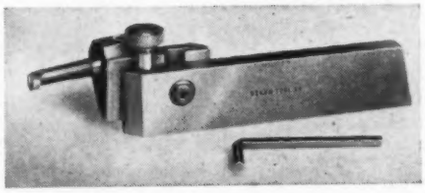
Standard sizes are ½-in. high and 2½-in. long; and ¾-in. high and 4-in. long. They are supplied with a 10° angle formed on one end, 2° clearance angles on each side, and in widths to suit.

Attachment for Grenby Grinders Gives Finish in Micro-Inches

An attachment for series 103 internal and external grinders for producing finishes below 2 micro-inches has been developed by Grenby Mfg. Co., Whiting St., Plainville, Conn. The Low Micro Finish attachment can be installed directly on the internal grinders in the series, but must be used with a complete head including the attachment on the external grinders.

Internal or external work can be finished with the attachments, with separate holders being used to hold the internal and external stones. Stones used are 400 or 600 grit in alundum or silicon carbide. Hardness ranges are from R 15 through R 65 by 10 point intervals.

Bokum Boring Toolholder Has Vertical Adjustment



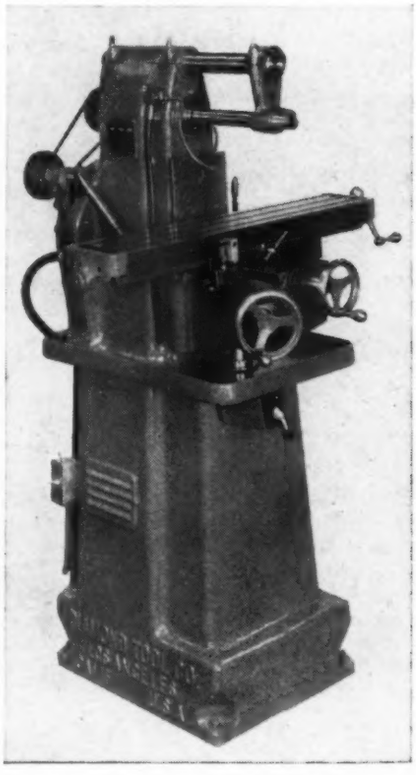
Vertical adjustment of boring tools is provided in a lathe toolholder designed by Bokum Tool Co., Detroit, Mich. Turning the knurled screw moves the tool in a vertical parallel plane to bring it to any precision setting.

The knurled screw has a hardened and ground Acme thread. The holder is available with ½- x 1¼-in. shank and ⅜- x 1-in. shank.

Diamond Machine Tool Builds Miller With A 30-in. Table

A new milling machine, Model M-30, is announced by Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif. The machine is equipped with variable-speed drives, built-in gusher pump coolant system, and a 1½-hp. motor. The spindle is mounted in Timken taper roller bearings and is hardened and ground with a No. 9 B&S taper.

The table is 7 x 30 in. with 18-in. longitudinal travel, 6-in. transverse travel, and 10-in. vertical travel.



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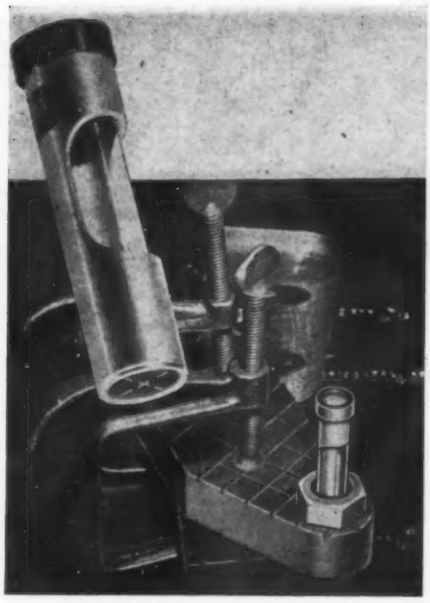
Benton Optical Centering Tool Locates Drill Templets or Jigs



A small, optical centering tool, the Opti-Setter, is made by the Benton Co., 351 S. La Brea Ave., Los Angeles 38, Calif. The Opti-Setter can be used to locate templets in proper relation to workpieces, center drill jigs to reference marks or to layouts, or as an inspection tool.

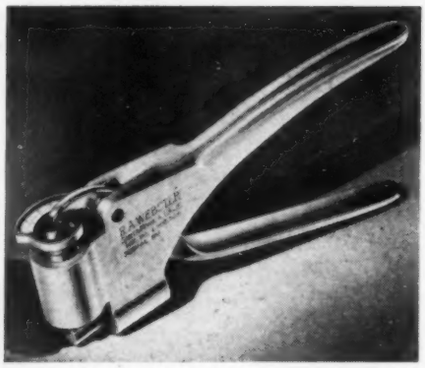
On drilling operations, it is inserted in a drill jig which is adjusted until the cross lines in the Opti-Setter coincide with any desired layout mark on the workpiece. The jig is then clamped in position and the Opti-Setter removed.

It is made in two sizes: ½-in. dia. by 3-in. long, and ¾-in. dia. by 3-in. long.

Webster Hand Hardness Gages Identify Non-Ferrous Metals

Two new hardness gages, Model B and B-75, for aluminum, copper, brass, and other non-ferrous metals, are made by R. A. Webster, 422 20th St., Santa Monica, Calif. Used to identify materials which have been heat-treated from those which have not, checking for use of improper alloy, or other purposes, the gages are small and easily used. Compressing the handle actuates the penetrator.

Model B is for aluminum alloys and provides a dial reading from 1 to 20, covering the range from soft aluminum to heat-treated and aged alloy. Model B-75 is for direct readings on brass and other non-ferrous metals within the range from soft brass to hard brass. A cylindrical anvil permits the testing of sheets, strips, tubes or extrusion.



GE Gage Tells Field Strength For Magnetic-Particle Testing

A magnetic-field gage which indicates relative strength of the magnetic field in parts being examined for flaws by the magnetic-particle method of testing is announced by General Electric Co., Schenectady 5, N. Y. It is said to be especially useful for testing large castings and forgings in which it is difficult to calculate the field intensity at various points from the current passed through the part.

When using the magnetic-particle method, flaws may be overlooked if the field is not strong enough to bring out the particle pattern. Identical flaws may appear as different sizes and give inconsistent results under such conditions. By giving a direct indication of field strength, the new gage permits standardized testing at fixed field intensities.

Both alternating- and direct-current field strength can be measured. Pole shoes are placed in contact with the test surface and current regulated to obtain the desired reading.

Thomson Bench Spot Welder Designed to Weld Small Parts

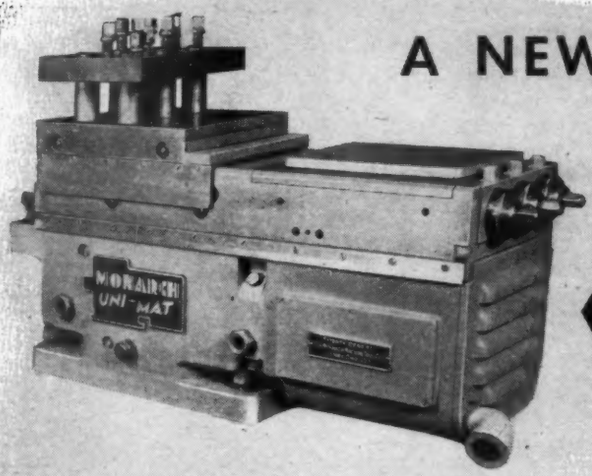
A bench-type spot welder suitable for rapid resistance welding of small parts is announced by Thomson Electric Welder Co., Lynn, Mass. The Model A-11 welder is driven by a ¼-hp. motor geared to a worm reduction unit which turns a cam shaft through a one-revolution clutch. Operation is started by a solenoid clutch controlled by a foot switch. The operator can either trip the clutch once to put the machine through a single welding cycle or by steady pressure on the switch keep the machine running constantly.

Transformer capacities of 10 and 15 kva. are available. Current control is obtained by a multi-leaf fan-type cam mounted on the camshaft. Heat regulation is provided by a 5-point regulator with a heavy copper arm and contacts for heavy loads.

The lower arm can be raised or lowered or shifted laterally as the nature of the work requires. Electrodes are water cooled.

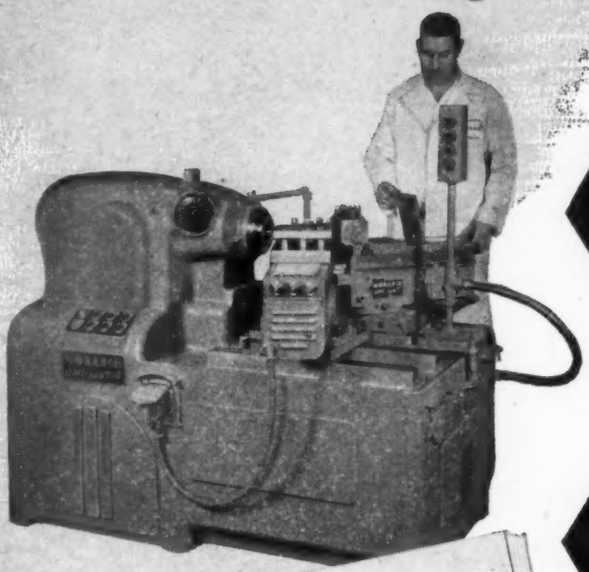
Etched Aluminum Decimal Chart Is Mounted on Drafting Machine

An etched aluminum decimal chart, designed for attachment to standard types of drafting machines, is made by Enterprise Products Co., 15½ South Van Buren Ave., Freeport, Ill. The chart is 3 x 5 in. and comes in two models to fit drafting machines using two parallel support bars and those with a single center bar.



A NEW PRINCIPLE IN METAL TURNING—

THE UNI-MAT
(INDEPENDENT MOTOR-DRIVEN TOOL SLIDE)



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THE UNI-MATIC
(A UNIVERSAL AUTOMATIC TURNING MACHINE)

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For chucking and fixture work—as small as 1″ and as large as 16″ diameter—the Uni-Matic combines sustained high-speed production with universal adaptability. Completely independent motor-driven tool slides (Uni-Mats) and preselected spindle speeds *as high as 5000 RPM* are tied into an electronically controlled cycle.

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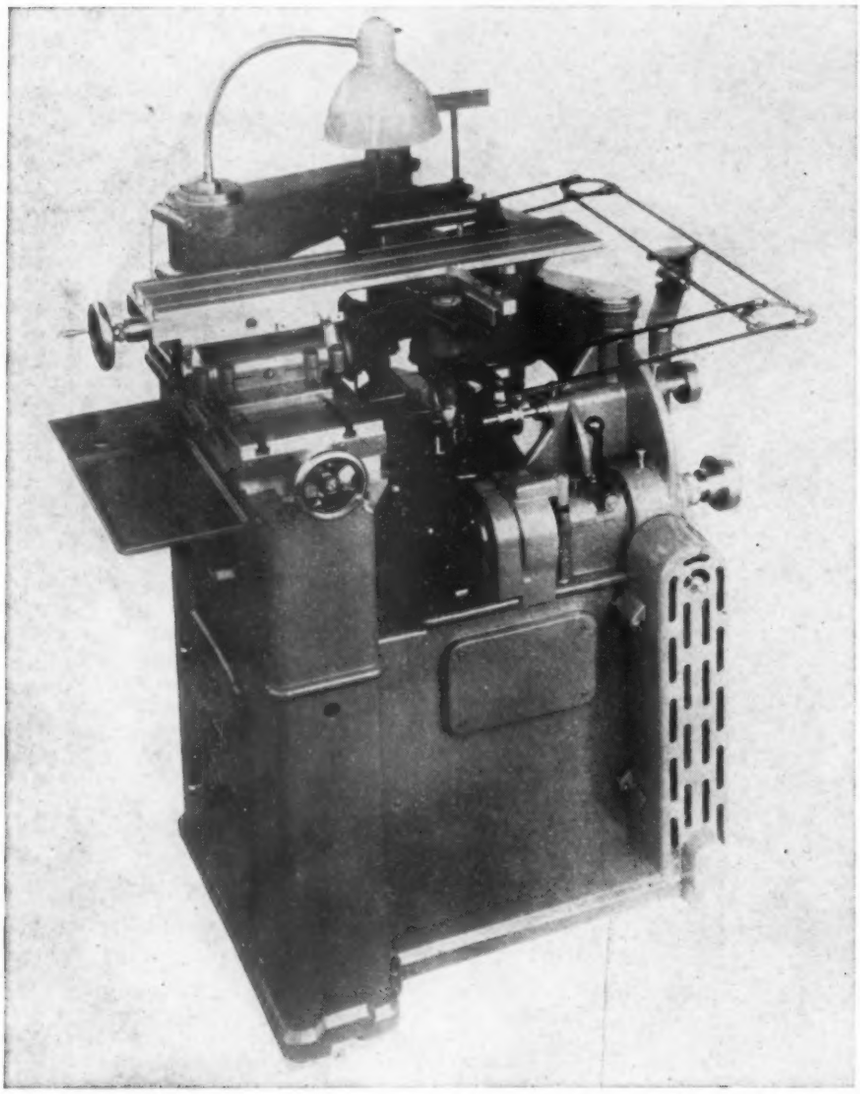
Studer PSM Profile Grinder Will Handle Hardened Work



Special attachment on this profile grinding machine allows the grinding of profiles up to 360° when making disk cams or similar parts

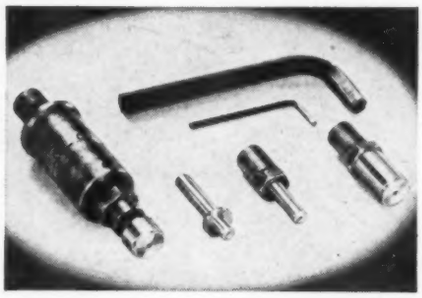
A precision profile grinding machine, type PSM, manufactured by Fritz Studer, is distributed by Cosa Corp., 405 Lexington Ave., New York 17, N. Y. It is designed for grinding profiles of hardened work pieces such as profile gages, form tools, and sectional dies. Flat workpieces of 2-in. thickness and 5.9-in. length and circular work of 4-in. diameter can be ground. Grinding is to an accuracy of 0.0002.

An enlarged assembly is followed by a tracer finger swiveling about its point. Linear movements are transmitted to the grinding wheel head through a pantograph and swiveling movements by turning the wheel about its cutting edge through link bars. The wheel is shaped before grinding to the shape of the tracer finger point in the same size ratio as templet to work piece.

The pantograph can be adjusted to any ratio required. The wheel is formed to the shape of the tracer finger by moving the finger along the edge of a hinged guidebar on the templet table. Movements of the tracer finger are reproduced by the wheel which contacts a diamond brought exactly in line with the swivel axis of the wheel head by means of a dial indicator.

Dies are ground by dividing into several sections, suitable places being chosen, and each section is ground separately. Carbide dies can be ground.

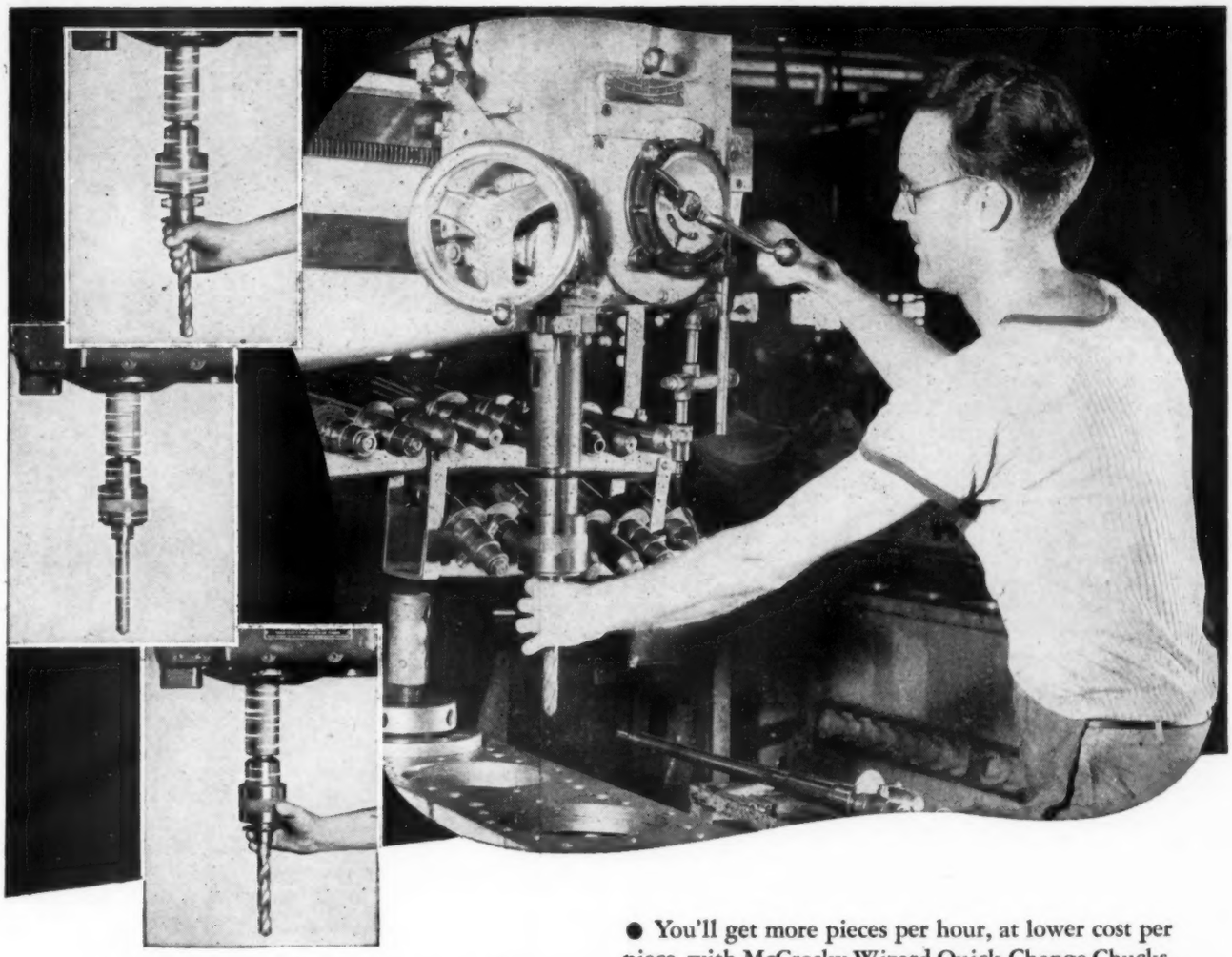
Hardinge Has Universal Stop To Be Used in Lathe Collets



A universal lathe collet stop for second-operation work which will convert any standard 1-in. capacity lathe collet into a solid stop or spring-ejector stop collet is announced by Hardinge Bros., Inc., Elmira, N. Y. No alteration of the standard collet is necessary. The stop is placed in the rear of the collet and anchored in place with a single locking bolt.

With the spring-ejector stop in place, parts are automatically ejected from a collet when it is open. The set consists of the collet stop body, one large and one small stolid stop insert, one large and one small spring-ejector insert, and the necessary wrenches.

FILE GAGE—This special gage is for inspecting Nicholson's triangular files that are used to refile saw teeth. The file must be a perfect equilateral triangle, so this gage was developed to check the width. Dial indicator is used for fast operation. Made by Federal Products Corp., 1144 Eddy St., Providence, Rhode Island



Multiple Tool jobs become *continuous* with McCROSKY *Wizard* Quick-Change Chucks

● You'll get more pieces per hour, at lower cost per piece, with McCrosky Wizard Quick-Change Chucks. The operator simply pushes the collet with the new tool into the revolving chuck. The positive automatic "Wizard" latch centers the tool instantly and locks it rigidly in place. For release, the operator simply grips the chuck lightly with the thumb and forefinger, and the collet drops out into his hand. There is no stopping, or even slowing down, the spindle for tool changes. Also ideally used when tapping, to prevent tap breakage.

McCrosky Wizard Quick-Change Chucks are furnished in four sizes, with standard Morse taper shanks. Write for Bulletin No. 16-D, it gives full details, or ask your McCrosky sales engineer to show you how Wizard Quick-Change Chucks can repay their cost over and over again in your plant too.

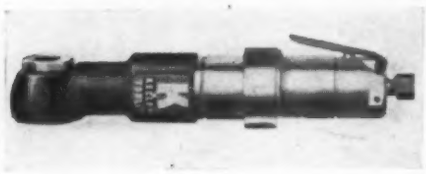
McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers
Block Type Boring Bars — *Turret* Tool Posts
Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

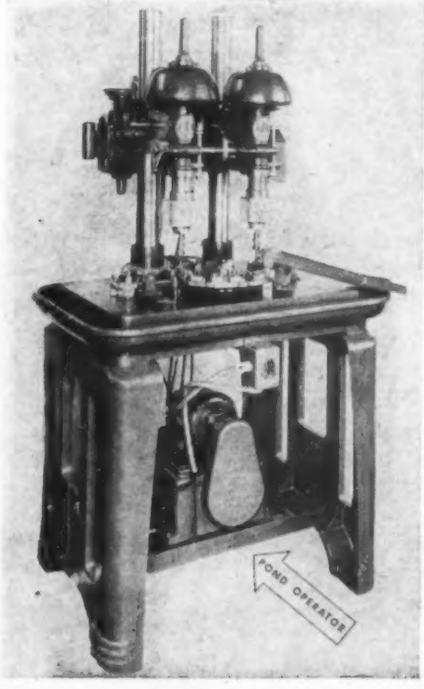
Keller Insert-Removing Tool Is For Plastic-Molding Work



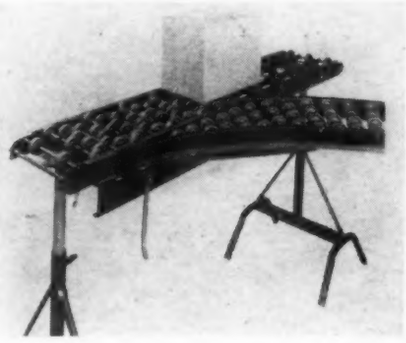
A fast, powerful insert-removing tool has been developed by the Keller Tool Co., Grand Haven, Mich. The unit is said to reduce insert-removal time and operator fatigue in a variety of plastic-molding operations. The Model 1458 delivers four times more stall torque than previous models. A lighter model is available where less power and more speed are required. Both models run in either direction, weigh 2½ lb.

Pond Automatic Control Unit Converts Hand-Operated Tappers

An automatic control unit for converting hand-operated tapping units to automatic operation is built by the Pond Engineering Co., 15 Park St., Springfield, Mass. Accurate indexing, locating, clamping, tapping, and ejecting are accomplished on a turntable fixture actuated by a Model 600 Pond operator.

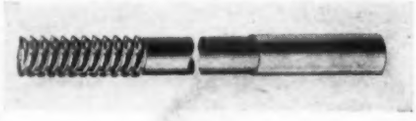


In the arrangement illustrated, two different pieces are handled simultaneously. Pieces are separated during ejection. A minimum of 70 psi. air pressure is required to operate the unit. Cycle speeds are adjustable from 2 secs. to 1 min. in the standard unit.



SPUR CURVE—Main line wheels on this conveyor are independently mounted. Their position is determined by hand levers on either side of the curve which raise and lower the switchplate to which they are attached. With switch in the up position, movement is along the main line, with the plate lowered, parts are diverted around the curve to the spur line. Made by the Rapids Standard Co., Inc., 308 Peoples National Bank Bldg., Grand Rapids 2, Mich.

Shearcutter "Rotary Broach" Has High Spiral Cutting Edge



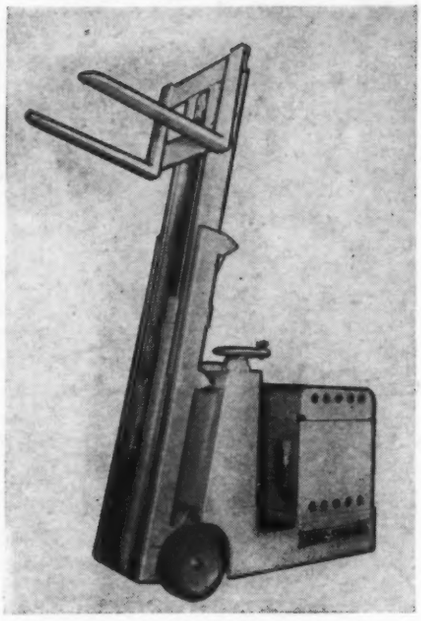
The Shearcutter "Rotary Broach" is announced by Fearless Tool Co., 1234 S. Gramercy Place, Los Angeles 6, Calif. The tool has a high spiral or helical cutting edge which removes the metal in a shearing manner.

The chips removed are said to resemble steel wool in form and texture. The broaches are said to produce a fine finish which often eliminates the necessity of additional broaching or grinding operations.

The broaches are made with straight shanks in sizes from ¼- to 1-in. by sixteenths, and from 1⅛- to 1½-in. by eights.

Lewis-Shepard Fork Truck Has Short Turning Radius

A 4000-lb. capacity electric fork truck with a limited length and short turning radius is announced by Lewis-Shepard Products, Inc., 222 Walnut St., Watertown 72, Mass. These factors, with a low center of gravity, are said to make for maximum maneuverability.



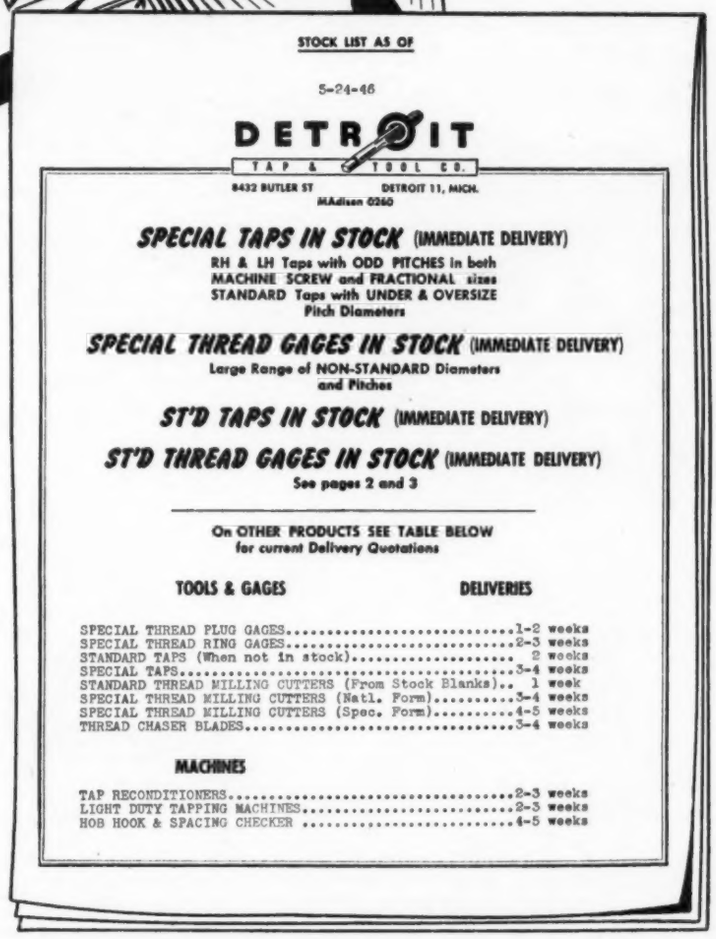
Using a 48-in. fork and carrying a 48-in. load, the truck will enter an aisle 12-ft. wide and in one continuous forward travel of the truck, make a single right angle turn and stack.

Light Kennametal Tools Have Clamped-On Tips

Two new tools with clamped-on tips for lighter machining jobs, are announced by Kennametal, Inc., Latrobe, Pa. Styles 1CL and 2CL have offset shanks and styles 11CL and 12CL have straight shanks.

Tips can be supplied with perma-

How to get Standard and Special Gages Quicker



STOCK LIST AS OF

5-24-46

DETROIT

TAP & TOOL CO.

8432 BUTLER ST DETROIT 11, MICH.
MAdison 0260

SPECIAL TAPS IN STOCK (IMMEDIATE DELIVERY)
RH & LH Taps with ODD PITCHES in both
MACHINE SCREW and FRACTIONAL sizes
STANDARD Taps with UNDER & OVERSIZE
Pitch Diameters

SPECIAL THREAD GAGES IN STOCK (IMMEDIATE DELIVERY)
Large Range of NON-STANDARD Diameters
and Pitches

ST'D TAPS IN STOCK (IMMEDIATE DELIVERY)

ST'D THREAD GAGES IN STOCK (IMMEDIATE DELIVERY)
See pages 2 and 3

On OTHER PRODUCTS SEE TABLE BELOW
for current Delivery Quotations

TOOLS & GAGES	DELIVERIES
SPECIAL THREAD PLUG GAGES	1-2 weeks
SPECIAL THREAD RING GAGES	2-3 weeks
STANDARD TAPS (When not in stock)	2 weeks
SPECIAL TAPS	3-4 weeks
STANDARD THREAD MILLING CUTTERS (From Stock Blanks)	1 week
SPECIAL THREAD MILLING CUTTERS (Natl. Form)	3-4 weeks
SPECIAL THREAD MILLING CUTTERS (Spec. Form)	4-5 weeks
THREAD CHASER BLADES	3-4 weeks
MACHINES	
TAP RECONDITIONERS	2-3 weeks
LIGHT DUTY TAPPING MACHINES	2-3 weeks
HOB HOOK & SPACING CHECKER	4-5 weeks

BALTIMORE 21, Md.....ESsex 2366
BIRMINGHAM, Ala.....Birmingham 7-1017
BOSTON 16, Mass.....LIberty 9398
BUFFALO 2, N. Y.....GRant 6601
CHICAGO 12, Ill.....KEdsie 3170
CINCINNATI 2, O.....MAin 2544
CLEVELAND 13, O.....CHerry 3520
DAYTON 2, O.....FUlton 6161
DENVER, Colo.....KEystone 7229
DETROIT 11, Mich.....MAdison 0260
FLINT, Mich.....Flint 4-3661
HOUSTON 2, Tex.....FAirfax 1426
INDIANAPOLIS 9, Ind.....FRanklin 2456
LOS ANGELES 37, Calif.....ADams 1-4381
MILWAUKEE 2, Wisc.....DAily 4256
MUSKEGON, Mich.....MUskegon 248
NASHVILLE 6, Tenn.....Nashville 6-3647
NEWARK 2, N. J.....MArket 3-1493
PITTSBURGH 19, Pa.....ATlantic 3011
PORTLAND, Ore.....VErmont 2334
ROCKFORD, Ill.....MAin 2243
ST. LOUIS 1, Mo.....CEntral 4435
SAN FRANCISCO, Calif.....DOuglas 7711
SEATTLE 9, Wash.....MAin 6427
SOUTH BEND 3, Ind...South Bend 3-0009
SPOKANE 8, Wash.....MAin 2191
SYRACUSE 9, N. Y.....SYracuse 8-1462
TOLEDO 4, O.....GArfield 8302
MONTREAL, Canada.....MAin 5346
TORONTO, Canada.....WAverly 2688
WINDSOR, Canada.....Windsor 4-9229

The quickest way is to call the Detroit Tap representative in your area. He has readily available up-to-the-minute stock lists of Detroit thread plug and ring gages. You can obtain a copy immediately and a revised copy every two weeks by phoning him today.

DETROIT
TAP & TOOL CO.
8432 BUTLER AVE. • DETROIT 11, U.S.A.

nent, molded-in chip breaker of constant depth, adjustable in width by varying the amount ground from the end or side cutting edges. The new tools are available in three sizes: 1 x 1 x 7 in., 1 x 1¼ x 9 in., and 1 x 1½ x 10 in.

The clamping arrangement is said to provide smooth, unimpeded chip flow. The tip is diamond ground on the bottom face and firmly supported by the plane surface of the steel shank.

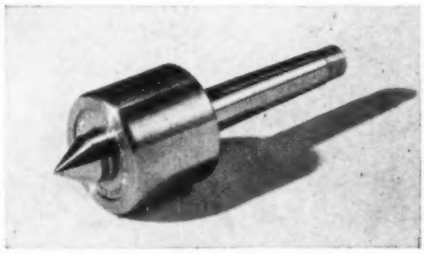
Carboloy Gear-Measuring Wires In Set Produced by Van Keuren

A new set of Carboloy gear-measuring wires, No. 20-1.68C, is announced by The Van Keuren Co., 176 Waltham St., Watertown, Mass. The set includes two wires each from 7 diametral pitch, 0.240-in. diameter, to 80 diametral pitch, 0.021-in. diameter. These wires can be used for measuring both external and internal gears. They are said to be accurate to plus or minus 0.000025 in.

Barco Micro-King Mill Drill Has Self-Centering Design

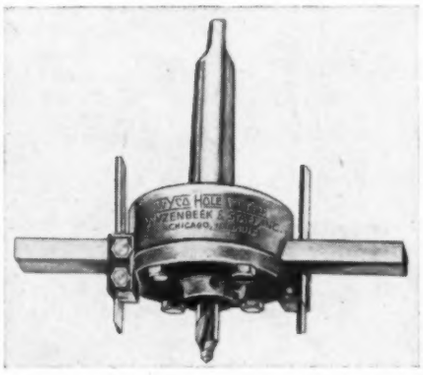
A mill-drill, the Micro-King, for sheet metal and plastics, is made by Barco Machine Products Co., 1975 E. 65th St., Cleveland 3, Ohio. Made of tool steel, the drills are self-centering, so that no lead holes are necessary. They are available in either high-speed finish or chrome-plated.

The drills are shipped coated with hard rubber which projects the cutting edges and can be easily removed before use.



LIVE CENTERS—Sizes range from No. 1 to No. 5 Morse Taper in this Regal live center made by Royal Products, Dept. A, 68 Spring St., New York 12, N. Y. The hardened and ground points are interchangeable

Hole and Washer Cutter Cuts Plate to ½-in. Thick



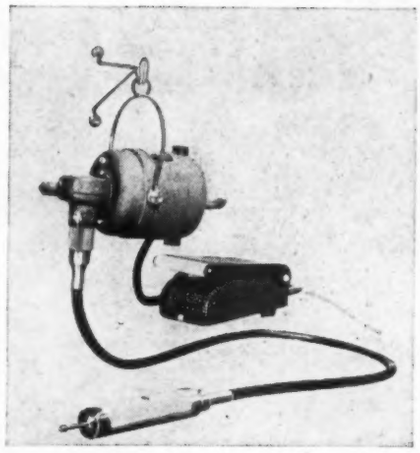
A heavy-duty hole and washer cutter that cuts through material up to ½-in. thick is made by Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill. The unit fits a 1-in. drill chuck, or can be furnished with Morse taper shank.

The cut is taken by two high-speed blades. The pilot pin is ½ in. in diameter. Either a pilot pin or a pilot drill can be used.

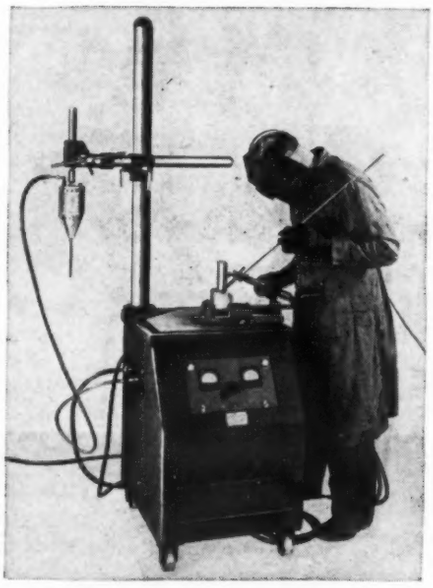
Dumore Flexible-Shaft Tool Uses Motor Hung from Hook

A flexible-shaft utility tool weighing 8 lb. is made by the Dumore Co., Racine, Wis. The 1/15 hp. motor is hung on a hook and a foot rheostat controls the speed.

The flexible shaft is 36½ in. long with a normal speed of 500 to 3,000 rpm., when connected to the gear reduction end of the motor. If direct drive is taken from the other end of the motor, speed is from 3000 to 10,000 rpm. Shanks of ⅛ in. diameter or less can be handled.



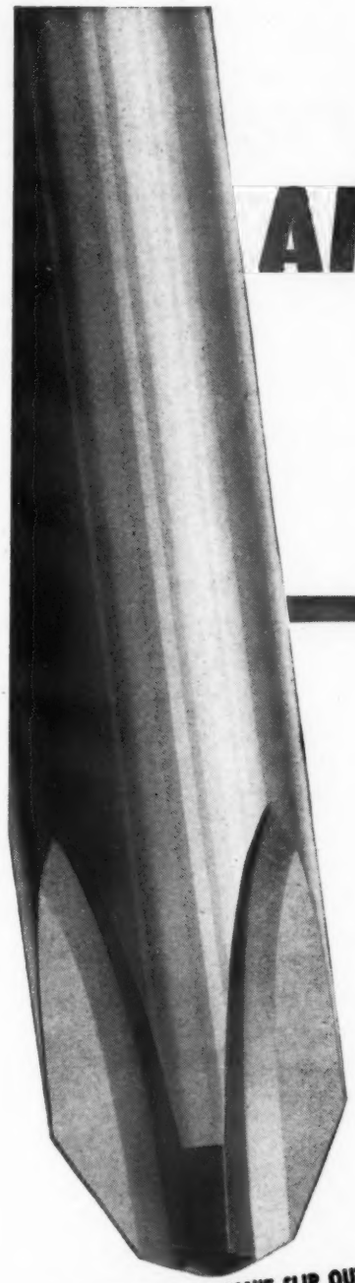
Thomas Metal Master Performs Eight Metalworking Operations



Eight different metalworking operations are possible with the Thomas Metal Master built by Clinton Machine Co., Clinton, Mich. It can be used for metal disintegration, arc welding, brazing, soldering, drill pulling, air extraction, metal etching and demagnetizing.

Said to use a new process of metal disintegration, it employs a low-voltage, high-ampere current flow to create a high temperature arc at the point of contact.

The arc-welding unit provides 100 amp. for 30-min. runs, up to 200 amp. for intermittent runs, with 8 heat stages, and uses up to 3/16-in. welding rods.



4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

TO HER TRAINED EAR... *Every*

AMERICAN PHILLIPS BOLT and SCREW

Even Has to *RING* True!

Every modern method of inspection and quality-control is used in American's plant. And American's inspectors become so highly efficient . . . so keenly attuned to their work . . . that even their ears become "educated." For example, these final inspectors can literally "hear" the presence of an undiscovered blank, an imperfect screw, or a screw of some other metal than that specified in the particular order under inspection. For as they pass their forks through each box, the slightest variations in sound of metal against metal are detected . . . and out comes the offending screw or bolt.

Here's another good reason why there's a higher "perfection-percentage" in every order for American Phillips Screws and Bolts . . . at least 144 perfect screws in every gross-box . . . regardless of type of screw or kind of metal: steel, brass, commercial bronze, stainless steel, aluminum, monel, everdur (silicon bronze). Add to this the basic American Phillips advantages . . . fast and fumble-proof handling, automatically straight *and 50% faster* driving, positive protection against split screwheads and scarred work-surfaces . . . and you have gained one of the few major cost-cuts that *any* plant can gain today.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

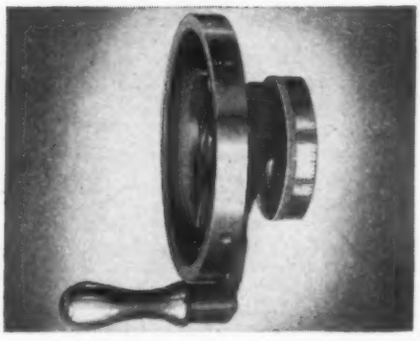
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Bldg.

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Commercial Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Parts and Materials

Gibbons Safety Handwheel Disengages When Power Starts



An improved safety handwheel, Model 5, is announced by Gibbons Mfg. Co., Box 517, Worcester 1, Mass. The handwheel is made in 4- to 12-in. dia. stock sizes.

The handwheel is keyed directly to the shaft. The safety handle in the safety position at the bottom of the handwheel cannot accidentally engage. Simple, positive motion to the top of the handwheel by the safety handle causes engagement. In this position it may be rotated without disengaging.

When power is applied to the shaft, the safety handle disengages. When automatically disengaged it falls to the safety position with a braking action which serves to stop the handle in bottom position. The handle can be disengaged manually by a slight backward motion. It can be provided with an adjustable graduated dial reading in thousandths of an inch of traverse.

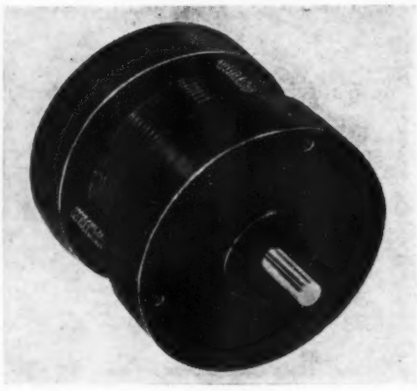
Pneumatic Check Valve Shuts Off If Line Breaks

A safety check valve which shuts off the air if air lines are accidentally disconnected or broken, the Numatic Safety Check is distributed by the E. D. Bullard Co., 275 Eighth St., San Francisco, Calif. Danger of whipping air hoses or damage to compressors or manifolds through travel-back of whipping action is prevented.

Excessive flow of air through the valve causes a steel ball to roll up a slope where it seals the port. A bleed hole allows the escape of a small amount of air, which equalizes the pressure and the line is again made air-tight. When pressure is nearly equal, the ball drops away from the port and rolls back into the sump.

The practice of crimping hose to shut off air while changing tools can be eliminated, since the valve shuts off the air if the tool is taken off the lines. The valve is made for working pressures up to 250 lb.

Transicoil Compact Motor Is for Remote Control Use



A compact, low-inertia motor for remote control application has been developed by Transicoil Corp., 114 Worth St., New York, N. Y. It operates on 60-cycle, two-phase current and may be wound to operate from 10 to 80 volts or more.

Designated as Model 2A Servo-Motor, it has practically constant impedance from full speed to stall. The standard stall torque, 11½ oz., can be changed as required. It is furnished with separate leads for each phase.

Porous Chrome Plating Method Applied to Aluminum Cylinders

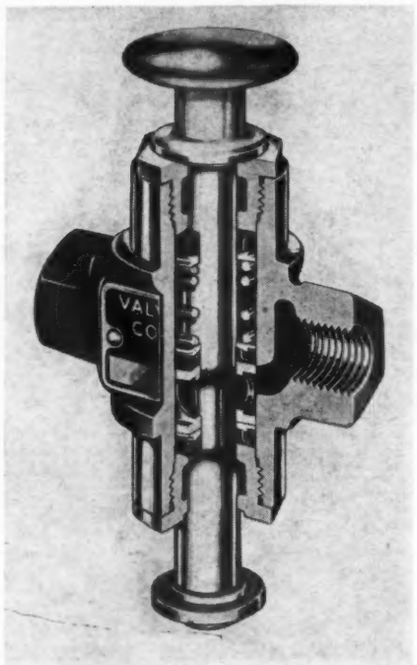
A method of "Porous-Krome" plating on aluminum has been developed by Van Der Horst Corp. of America, Olean, N. Y. The Porus-Krome process is a method of applying pure chromium that produces thousands of tiny pores in each square inch of surface. These recesses serve as reservoirs to hold oil for lubrication. Use of the process is said to permit use of aluminum cylinders or liners, chromium plated for wear resistance.

Holliday "Speed Treat" Steel Available in Rolled Flats

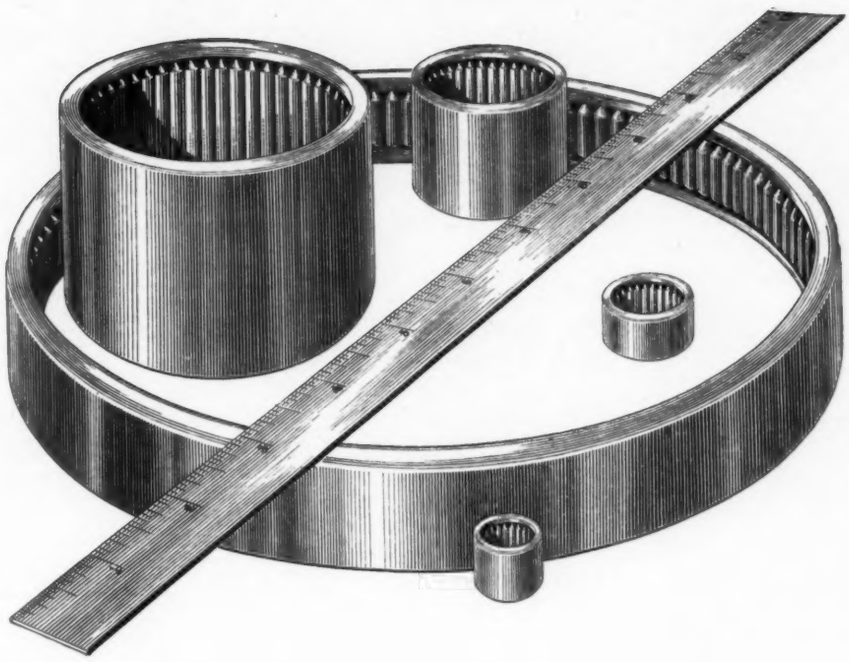
"Speed Treat" steel is now available in standard sized rolled flats, according to W. J. Holliday & Co., Hammond, Ind. The flats are available in 20-ft. lengths from ½- to 3-in. thick in standard widths. They eliminate the necessity for torch cutting when stock of narrow width is needed.

Acromark Has Flexible Inks For Marking Plastic, Rubber

Inks for marking plastics, rubber, and insulated wire and cable have been developed by the Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J. Separate inks are used for each material, and are available in a variety of colors in either liquid or paste form. The inks are designed to penetrate the surface and dry in a flexible state.



AIR VALVE—Series of valves made by Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, has area through the valves equivalent to pipe sizes to eliminate air flow restrictions. Cylindrical ends are identical permitting variety of control combinations. Valves operate on air pressures to 200 lb. and temperatures to 120 Fahrenheit



How Big Should a Needle Bearing Be?

. . . Big enough to carry the load. But whatever the actual size required—the Torrington Needle Bearing is the most *compact* anti-friction bearing unit ever devised.

In relation to its radial load capacity it has the smallest O.D. of *any* comparable anti-friction unit—an important design advantage from the standpoint of space-savings and weight reduction.

Experience in hundreds of different applications has demonstrated the practical advantages of this high unit load capacity in terms of design improvement, increased operating efficiency, and manufacturing economy.

Ask our engineering department to translate these Needle Bearing features in terms of *your own design requirements*. . . to show you how *small* a bearing can be to give you all these advantages. Your inquiry involves no obligation.

THE TORRINGTON COMPANY

TORRINGTON, CONNECTICUT SOUTH BEND 21, INDIANA

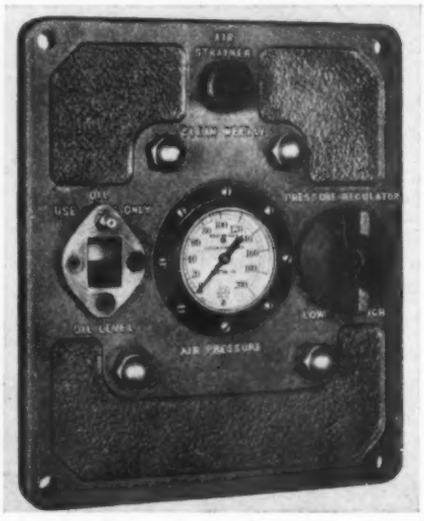
Offices in All Principal Cities

TORRINGTON NEEDLE BEARINGS

Carlyle Johnson Maxitorq Has Ring-Type Driving Cup

Ring-type driving cups have been developed for the Maxitorq Multi-Disk clutches made by the Carlyle Johnson Machine Co., Manchester, Conn. These driving cups are said to provide economical means of adapting clutches to various types of driven or driving members. Made to standard specified limits they permit piloting the inside or outside diameter with pulley, fly wheel, sprocket, gear, sheave, or other method.

Marton Air Control Panel Unit Mounts in Cavity of Machines

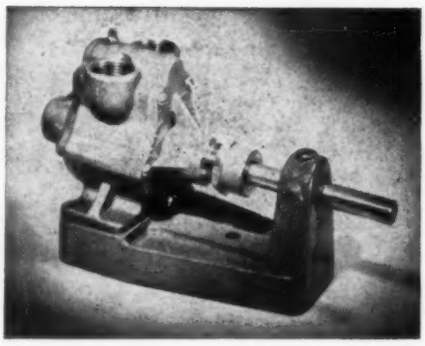


An air control assembly including an air valve, pressure regulator, lubricator, air strainer, and air gage is made by Marton Air Equipment Division, Lehigh Foundries, Inc., Easton, Penna. This panel unit is compactly designed to fit a cavity in machine tools and equipment.

Size of the panel is 8-1/16-in. wide and 9¼-in. high. It will accommodate ⅜- or ½-in. pipe size. The air strainer can be removed from the front of the panel.

Capewell Steel Made in Precision Ground Flats

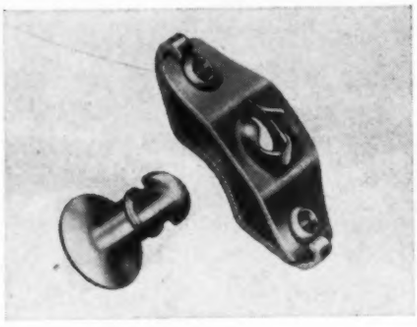
Precision ground flat stock has been made available by the Capewell Mfg. Co., 60 Governor St., Hartford 2, Conn. It is manufactured from electric furnace steel, annealed for easy machining, and is ground within 0.001 in. in thickness. It can be hardened in either oil or water to Rockwell "C" 66. Edges and ends are square and burrs removed.



ECO Double-Impeller Pump Works In Either Direction

A double-impeller gearless pump for circulation of water, light oil, and other liquids is made by ECO Engineering Co., 12 New York Ave., Newark, N. J. The impellers are made of several layers of pressure-vulcanized, laminated material, and will pump in either direction.

The built-in driveshaft bearing and base are said to eliminate side-pull when the pump is powered by a belt-drive and pulley. It also furnishes a solid base on which to mount the pump. The impellers will pass grit or fillings without jamming or stripping and without damage to the pump.



Quarter Turn Locks the Head In Cantilever-Spring Fastener

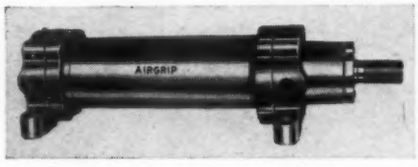
A fastening device developed for aircraft use during the war is now available for general use. Made by Lion Fastener, Inc., East Main St., Honeoye Falls, N. Y., the fastener consists of a stud and a cantilever spring assembly.

The spring assembly, including a cantilever-type spring and base, is spot welded or riveted in place. When assembly is desired, a quarter turn of the head locks the stud. The base forms a supporting member for the spring under extreme load, limiting its deflection and preventing loss of spring tension.

Goodyear Griptred Flooring Can be Sprayed or Brushed

Griptred, a non-slip safety flooring developed during the war is now available for general use. Made by Chemical Products Div., Goodyear Tire and Rubber Co., Akron, Ohio, it is a combination of abrasive aggregate and plastic binder. The abrasive aggregate is said to withstand crush loads in excess of 7,000 psi. The material can be applied by trowel, spray gun, or brush.

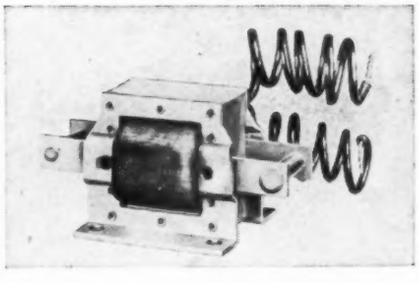
Anker-Holth Hydraulic Cylinders Are Made in Seven Mountings



A line of non-rotating hydraulic cylinders in 11 sizes and seven mountings is announced by Anker-Holth Mfg. Co., Port Huron, Mich.

The cylinders are designed for pressures up to 750 psi. or from 750 psi. to 2000 psi. Size range from 1½-in. to 8-in. bore. Mountings available include foot, trunnion, center line, clevis, rod-end flange, blind-end flange, and adapter.

The cylinders are of keeper ring design without the use of tie rods. They have two-way action and cushioned operation.



Barnes Midget-Size Solenoid Is Not Affected by Coolant

Improvements in the Midget-Size Solenoid made by John S. Barnes Corp., Rockford, Ill., are intended to give long life with trouble-free service.

A pull of 4 to 7 lb. is exerted by the plunger when it is extended between ¼ and 1-⅛ in. When the plunger is seated, the hold-in pull is between 13 and 15 lb. The coils are treated so they will not be affected by oil or coolant.

AVAILABLE NOW!

REVERE MAGNESIUM SHEET CAN HELP PUT YOUR PRODUCT IN A PROFITABLE CLASS BY ITSELF

IF sheet metal deliveries are all that is holding up your production, you can quickly give your plant the green light. Revere magnesium alloy sheet can be shipped to you in short order. It comes in a variety of standard sizes and gauges or it will be produced to your specifications—in either of two qualities: Commercial or Aircraft.

This means not only that you can start producing without further delay, but also that you can market a new, improved product without extensive redesign. For Revere magnesium alloys, with nearly the strength of steel, are so feather-light that they often eliminate from a product one-third to one-half of its weight.

Such products offer new values to the user, tend to rise above competition and command more attractive selling prices. That is why Revere magnesium alloy sheet can help you produce *now* at a profit!

Revere magnesium products include sheet, plate and strip, rod and bar, pipe and tube, extruded shapes, and forgings. Revere aluminum alloy products include pipe and tube, extruded shapes, and forgings. A Revere Technical Advisor will gladly consult with you about the application of these metals to your business. For prompt service on magnesium sheet call Revere today.

• • •

Like other metals, magnesium is priced by the pound. But a pound of magnesium is so much greater in volume and goes so much further that a price comparison on a cents-per-pound basis is misleading. Always compare magnesium's cost with that of another metal after first finding how many pounds you will save with magnesium. You will likely discover that Revere magnesium alloy is entirely within your reach.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

OUT OUR WAY
I'M LEAVIN'! WHEN I WANTA DO SOME FANCY ICE SKATING ER BALL-ROOM DANCIN', I'LL DO IT IN TH' PROPER PLACE--NOT ON TH' SHOP FLOORS!
TUT--TUT-- GO ON, PEDDLE YOUR PAPERS!
HE'S TALKIN' LOUD-- BUT HE'LL BE BACK WHEN HE FINDS OUT THE BOSS HAS ORDERED SOL-SPEEDI-DRI FOR THEM ICE-SLICK FLOORS!
LOUD BUT NOT LONG
J. R. WILLIAMS
T. M. REG. U. S. PAT. OFF.
COPR. 1946 BY NEA SERVICE, INC.

SOL-SPEEDI-DRI MAKES FLOORS SAFE FOR WALKING

SPREAD SOL-SPEEDI-DRI AROUND, and you cover dangerous, oil-glazed surfaces with a Magic Carpet . . . no falling, no slipping with SOL-SPEEDI-DRI underfoot. Sweep it up with an ordinary stiff broom . . . and floors are left clean and safe. SOL-SPEEDI-DRI in time will remove even the oldest oil- and grease-stains!

It's economy-wise to use SOL-SPEEDI-DRI, too. No trained personnel . . . no costly machines . . . are necessary to apply it. One man can do all the work required . . . releasing man-power for more productive work. SOL-SPEEDI-DRI works well on all types of floors . . . cement, wood, or composition . . . without interrupting shop-routine or production. It works . . . while *you* work in safety!

SUPPLIERS:—*South, Midwest, and West Coast:* Waverly Petroleum Products Co., Philadelphia 6, Pa.
East: Safety and Maintenance Co., Inc., New York 1, N. Y.

SOL·SPEEDI·DRI
OIL AND GREASE ABSORBENT
FREE SAMPLE
Just write "SOL-SPEEDI-DRI" on your business card or letterhead and mail today.
UL

TO THE EDITOR

BURNISHER DRAWS COMMENT

I would like to add some comments on the triple-roller burnisher which appeared in "Practical Ideas" recently and was later discussed by Frank C. Hudson. I will agree with Mr. Hudson that a bearing rolled or burnished with a single roller may be out of round, but it should be perfectly true when three rollers are used if the steel in the axle is reasonably homogeneous and has no hard or soft spots. Mr. Hudson's "proof" of his claim (using a grinding machine to show where the rolled surface is uneven) may be due to many other causes. The axle center holes may be rough or pitted when the axle is old, or there could be some machine defect causing vibration or uneven turning. Because the triple-roller method is independent of the accuracy of the machine, it will often save much time and money in an attempt at super-accuracy that's not called for on this class of work. In my opinion, the Pennsylvania's triple-roller burnisher is a contribution of real merit, and all those now using a single-roller tool should read the article and then make one.

The rolled bearing has the further advantage over a ground surface in greater hardness and therefore longer service life. Michael Axler

•

TOOLS AND TRAINING

Your editorial "Tools for Schools" is good as far as it goes. However, some of the equipment used in shop training during the war has already been turned over to the local school boards. At Astoria, Ore., and at Vancouver, Wash., I am informed this has been done.

Merely turning over equipment may mean something or nothing. In most cases the cost of conducting trade courses, which are very expensive, is an all-but-impossible burden to the already underfinanced local school boards.

Also, such courses, if supervised by strictly academically qualified men and conducted by what, during the war, we called "high school mechanics," might be of little value and of some positive harm to trainees.

In turning over shop equipment, the federal government might well provide a measure of financing worthwhile programs and of establishing a program to insure really qualified

Do All This with One Tool

The Black & Decker Portable Electric Sander is more than a Sander! It's also a Grinder—a Wire Brusher—a Planer—a Surfacer. It drives a wide variety of attachments to make quick work of a tremendous variety of jobs.

With abrasive discs in 19 different grains, it sands and finishes any surface. With Wire Cup Brushes, it takes off old paint, rust and scale . . . cleans castings, tanks, boilers, vats, sheet metal and soldered joints. With saucer or cup-type grinding wheels, it removes metal—smooths welds and casting ridges—grinds off old rivets, studs and bolts—sharpens stationary machine blades often better than a Portable Grinder. With rotary gouging and planing heads, it shapes and semi-finishes lumber, removes stencil and brand marks from barrels and boxes—faster, cleaner, more uniformly.

Check your nearby Black & Decker Distributor today on these versatile Sanders. Due to the heavy demand, he may not always have them in stock . . . but it's worth getting full information on tools that have so much to offer. For our catalog . . . containing details on Black & Decker Portable Electric Sanders and other Portable Electric Tools—write to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Md.

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Representing a new development, WELDON Stub Arbors are specially designed to be used in place of the longer, unwieldy, conventional type of milling machine arbors. They can be handled with greater ease and convenience. At the same time the initial cost is less.

They are firmly held by the successful double screw drive and are especially adaptable to tool room and light manufacturing operations. Sold in sets or singly.

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THE WELDON TOOL CO. Cleveland 4, Ohio
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supervisors and real trade trained and otherwise qualified instructors. Such a program would result in industrial opportunity for large numbers of ex-service and other young people.

Since we are living in a civilization which is largely dominated by machinery, no one is really intelligent unless he has knowledge of the construction and operation of mechanical equipment. Moreover, this knowledge to be real and effective had best be had by participation—learning by doing in a real shop, operating real tools and machines.

Lewis W. Spaulding
Astoria, Ore.

•

GIVE AND TAKE

The labor and management war sweeping the country today is gradually destroying all personal contact between employer and employee by building a wall so high that they will never meet except across a table at a labor meeting. How far this condition can go no one can say, but we all know that in the process all persons will suffer because cooperation is essential to the success of any enterprise.

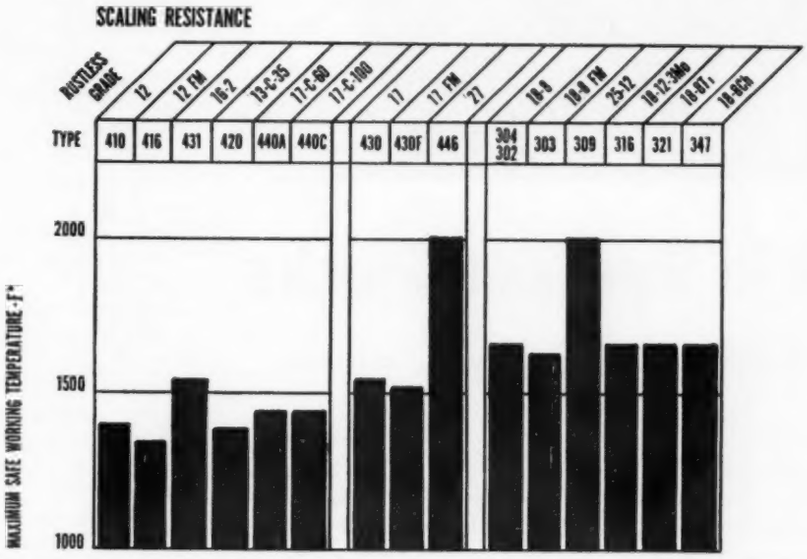
As a result of all this strife, personal pride in doing a job well has slipped to an all-time low because the attitude of the worker has gradually dropped to a stage where a job in a factory has only one meaning, "Financial Gain." I would be willing to say without fear of contradiction, that if all sources of employment were paid on an equal basis, plants would suffer greatly because of lack of interest and enthusiasm.

It is the hope of every ambitious person to climb to a certain goal or reach a peak of perfection, whereby he can do his particular task better, or as well as anyone else. It is this ambition that makes a man a satisfied and willing worker. After watching the same men over a period of time you can see the change that is taking place. A few years ago if you asked a fellow worker anything pertaining to his job or yours, he wouldn't hesitate to tell you all he could, but now he will either tell you to go to hell, or see your supervisor, or both. Now in order to continue on his way he must be provided with some sort of incentive, and the only lasting one is the praise and credit passed on to him by his supervisor. This creates in the mind of the worker the feeling that he has done his job well and at the same time makes good relations between employer and employee.

RUSTLESS DATA SHEET NO. 5

Corrosion Resistance Plus Resistance to Scaling at High Temperatures

One of the Many Combinations of Properties Offered by Stainless Steels



IN A SENSE, corrosion, oxidation and scaling are all the same. Scaling or oxidation is merely an accelerated form of corrosion taking place at high temperatures. Each produces the same result—reduction of the effective body of a part with consequent reduction in its physical strength and performance. The continuous performance of stainless steels at high temperatures in highly corrosive atmospheres is responsible for their extensive use in heat exchangers, industrial furnace supports, domestic stove and heater parts, valve stems, valves, torch heads on cutting and welding equipment, exhaust stacks, jet and gas turbine parts for aircraft.

Stainless steels, like other materials, vary in their resistance to corrosion and high temperature scaling. The above chart was prepared from data obtained by heating polished samples in ordinary slightly oxidizing furnace atmospheres, using circulating air as in the case of electric furnaces. It indicates that alloys lower in chromium, such as Types 410 and 416 (12% chromium) resist scaling up to approximately 1400°F. Higher chromium and high chrome-nickel grades such as Types 446 and 309 (25-27% chromium) withstand the withering effects of 2000°F. Ordinary steel scales at about 900°F. Thus, the remarkable property of stainless steel is that when the chromium content is increased, resistance to scaling is increased. Type 446 (Rustless 27) should be used for high temperature service only when stresses are low; whereas Type 309 (Rustless 25-12) can be used when conditions require high tensile strength combined with resistance to scaling and corrosion.

At high temperatures most commonly used metals and alloys form weak, porous scale which flakes off, opening the way for progressive deterioration. Stainless steels are different. Scale is tough, impervious, and strongly adherent, and offers protection against further attack. When you want to know more about the properties of stainless steels at any temperature . . . ask the leading specialists in stainless steels . . . call on Rustless.

If you have been confronted with a confusion of trade names of various stainless steels and would like to relate all producers' commercial designations with standard AISI type numbers, government specifications, and ASTM standards, write for Rustless' handy chart entitled, "TRADE NAMES OF STAINLESS STEELS."

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Old friends, the alloy steels for which Ryerson stocks were distinguished in the days before Pearl Harbor, are back from war. They have been at the front for more than four years but now their special war jobs are finished and these steels are again available to everyone for prompt shipment from eleven Ryerson plants.

Of course the wartime triple alloys which proved satisfactory have been adopted as standard AISI steels and continue in Ryerson stocks. Both prewar and triple alloys in a wide range of sizes make your nearby Ryerson plant the ideal source for every alloy requirement.

In addition, Ryerson alloy service provides the advantages of the Ryerson Certified Steel Plan, featuring a time-saving Alloy Report with every shipment. The chemical analysis, heat treatment response and recommended working temperatures included in the report are a helpful guide for designers and heat treaters, a reliable record for purchasing men.

Diversified stocks plus the quality assurance of the Certified Steel Plan are two reasons why more manufacturers depend on Ryerson for alloy steel from stock than on any other source. Whatever your alloy requirements, let Ryerson specialists work with you to supply the steel you need, when you need it. Call, wire or write the nearest Ryerson plant.

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RYERSON STEEL

war, when courses or lectures on industrial supervision were conducted, the keynote was always "Know your employees." They even went so far as to suggest keeping informed on their home life, social activities and hobbies, using this information to create a better understanding between employer and employee. Now this seems to have been forgotten in the rush of reconversion problems and labor negotiations. But it is my belief this should be re-opened and demanded by management from its supervisors.

What has happened to shop training programs? Are they to be shelved also? A few years ago, if a man showed ability and ambition to learn he was taught how to operate a wider range of machines. This training is definitely to the advantage of the employer, especially today when production is so vital and in the near future when competition will be intense. By proper training of a group of men they can be so well organized that complete rotation of jobs is possible and a supervisor can shift men anyway he sees fit, without granting special privileges to any individual. The biggest gain that management can receive is the worker's confidence in the company because he knows the cost and time required to be trained for many jobs and at the same time he realizes the company is offering opportunity to advance.

In conclusion I would like to add, I do not wish to take sides on the labor situation and I don't pretend to be an economist, but if quality of product is to be considered, I sincerely believe that management and labor should make the necessary sacrifices in order to establish a lasting harmony. This can only be done by friendly and honest personal relations.

Lyle C. Vinger
Waukesha, Wis.

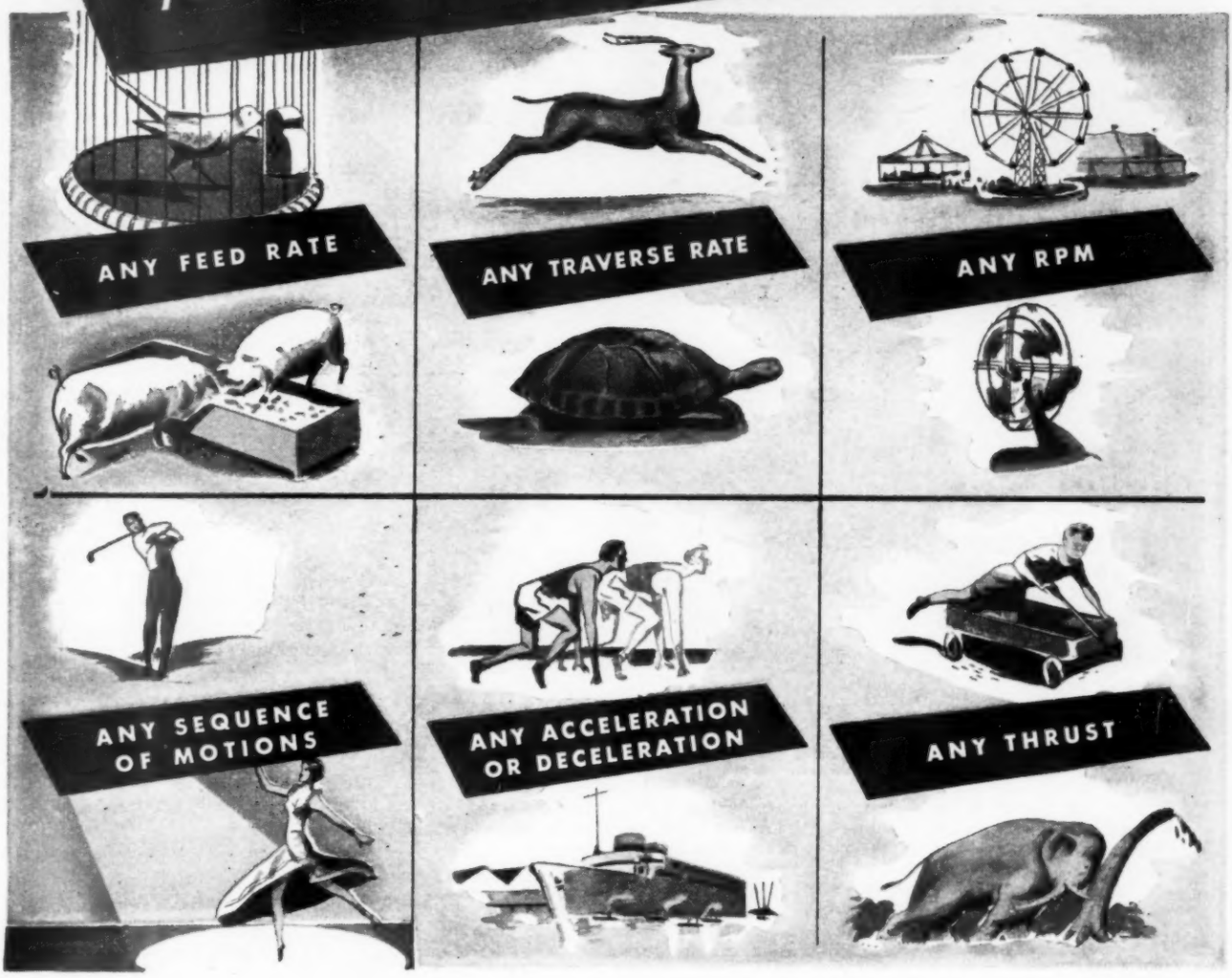
Machinists Heaven

DONALD R. TRYER

When the last rough casting's finished,
And our production battle won
When my lathe is clean of shavings
And the Big Boss says "Well done!"
I'll pack my tools together
Then tell the gang "Goodbye"
As I take a job forever
In machine shops in the sky.

Where hand tools do not tarnish
All gages hold dead true,
Where planer, lathe and drill press
Are always just like new.
With hate and strife forgotten
Where mankind dwells in peace.
I'll stow my kit in a locker
In the shop where machinists meet.

VERSATILITY that *Exactly* meets your needs in MACHINE TOOLS



Machine tool design is set free from a host of limitations when Vickers Hydraulic Controls and Drives are used. With no difficulty at all, the designer has an extremely wide choice of feed rates, traverse rates, RPM, sequence of motions, accelerations or decelerations, and thrusts.

Practically any machine tool can be designed *and built* to do *exactly* the required job by using Vickers Hydromotive Controls in one of the infinite number of combinations provided by more than 5000 standard Vickers Units.

In addition, positive overload limitations can be built into any machine—definite safety factors provided for both the machine and the operator.

Only Vickers Hydraulic Controls provide *all* the advantages of hydraulic operation—including exceptional compactness and reliability.

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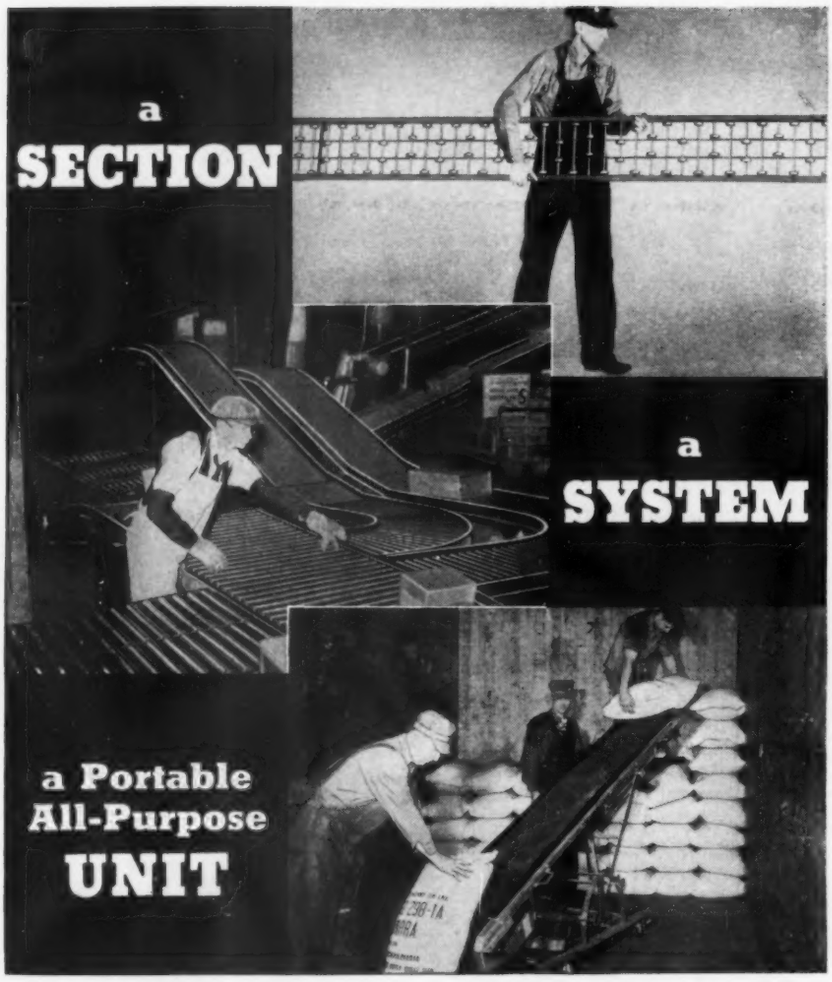

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BECAUSE Standard builds power and gravity conveyors in light—average—or heavy duty types for either stationary or portable use, as well as a wide range of special types, you can install Standard equipment as you need it.

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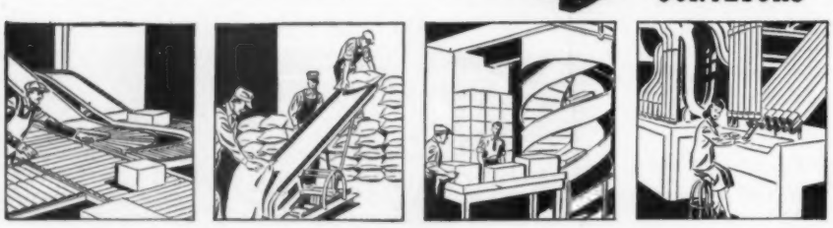

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ROUND TABLE *Discussion*

TO BE—OR NOT TO BE YOUR OWN BOSS?

This is the experience of a friend of mine who we'll call "Joe Precision."

Joe was a good average machinist, and his sole dream was to run a shop of his own. The late war found Joe working overtime with several second-hand machines in a garage, doing odd jobs in addition to his regular work as a Machinist Group Leader in the shops of an electric company.

A flood of war orders poured over from his employer to him in the way of small sub-contracts. As these became larger, Joe quit his regular job and moved his second-hand machines to a regular shop which he proudly named "The Precision Tool & Machine Co."

At the end of the war Joe found himself some fifty grand richer than he was four years before, and the proud owner of a rather modern machine shop. Thought Joe to himself: "This is duck soup, I'll step out now that the war is over, with plenty of labor to be had, etc., and clean up in any line of business that looks good to me."

Without further ado he stepped out and into a big hole. After struggling around for four or five months he was forced to close his new shop with considerable loss. Joe realizes now a lot of things he never even dreamed of before; things which he could have learned if he had not been blinded by the thought that he "knew it all," based simply on the fact that he made money in war times when anyone with a drillpress or a lathe could get all the work they wanted and at profitable rates.

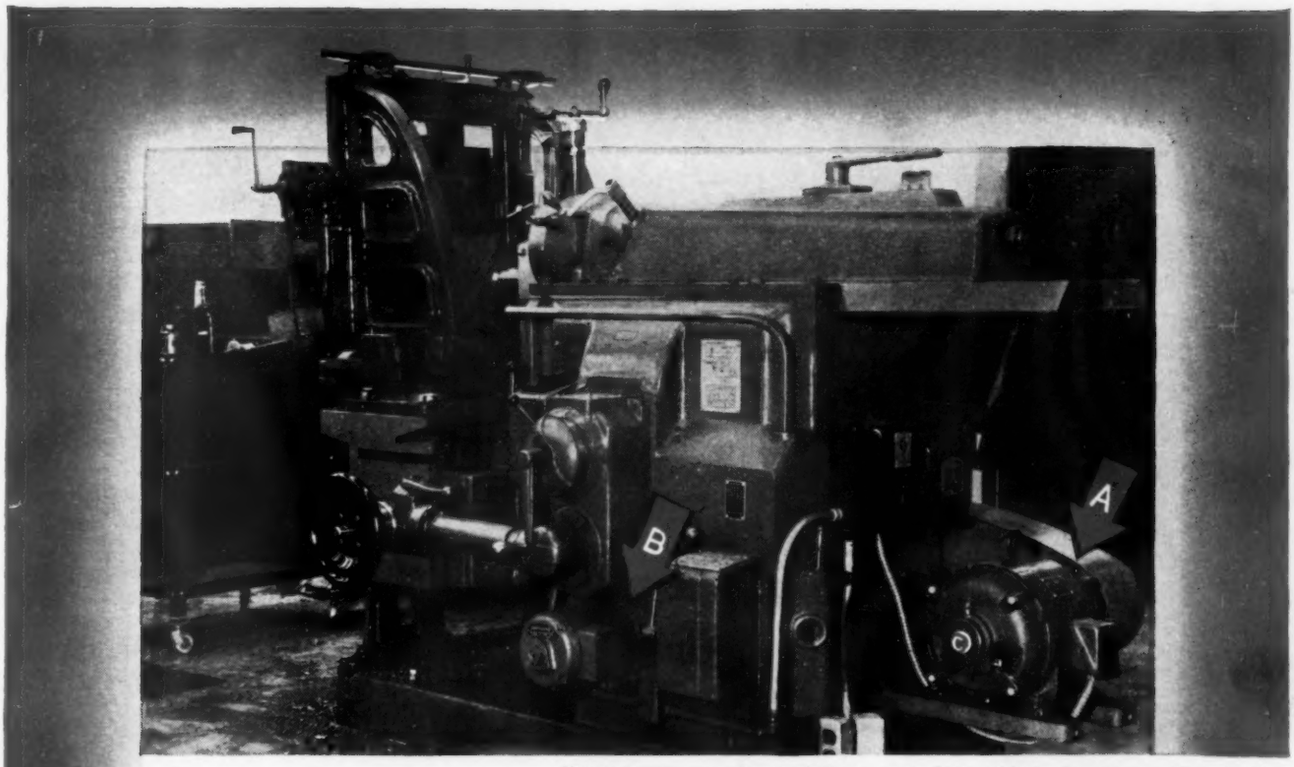
The principal things that stand out now in Joe's memory are:

1. That running a shop, or making an article, is but one step in conducting a successful business.

2. That most anyone with a machine shop can make money in war times.

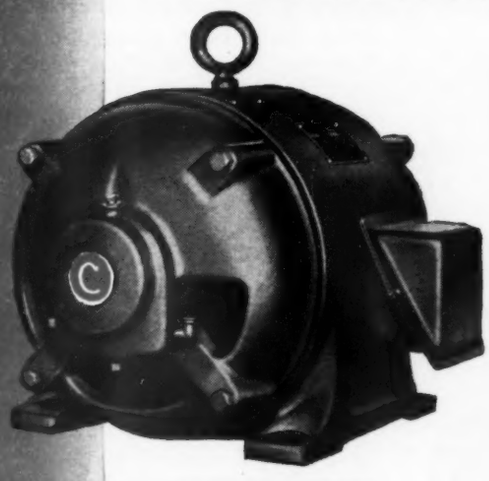
3. That a good business man must know the relative value of each department and its inter-dependence on other departments for the good of the business as a whole.

4. That there is a vast difference between being just a good shop operator and being a good business man.



(A) 3 horsepower Squirrel Cage main drive Motor for shaper. Top half of motor enclosed. **(B)** ⅓ horsepower Squirrel Cage traversing Motor drives the table gears moving the work across the tool travel.

Get All the Precision Your Machine Was Designed to Provide With CENTURY MOTORS' Remarkable Freedom From Vibration



Century motors' remarkable freedom from vibration contributes to the accuracy of the driven machine. Their ability to start, come up to speed, and run smoothly, helps to hold the precise tolerances demanded of tool room machinery — minimizes the possibility of vibration creating imperfections in the work.

Century motors are accurately and rigidly constructed — well balanced mechanically and electrically to maintain their smooth operation throughout a long life of satisfactory performance. The Form J design shown in the illustration has the top half of the motor enclosed to prevent chips from falling into the operating parts.

Century motors are engineered to the functional characteristics of the machines they drive to assure top performance.

Specify Century motors — built in sizes from 1/20 to 600 horsepower.

Century C MOTORS

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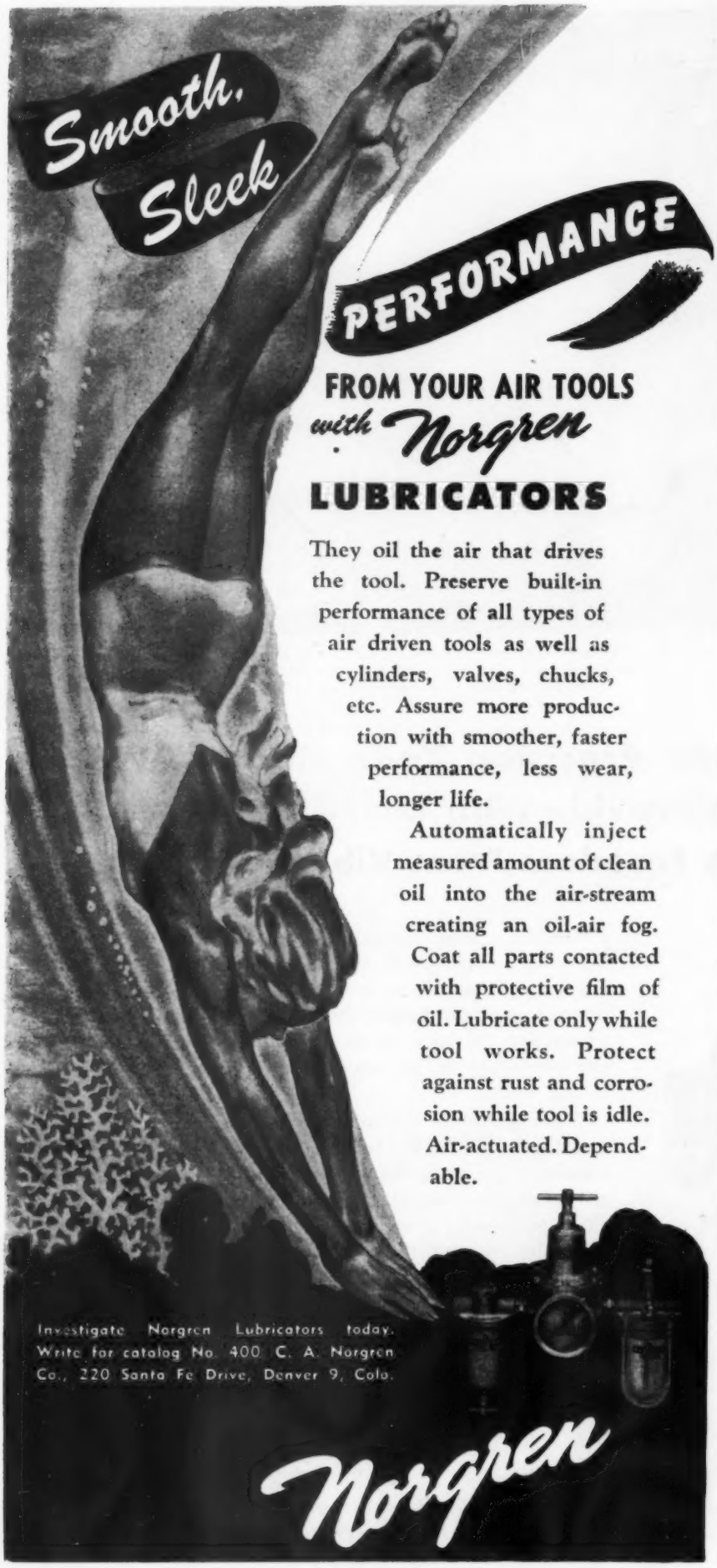
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When Joe came to the point where he realized he didn't quite know it all, even though he made that fifty grand during the war, he had his new business failure analyzed and this is what they showed him:

On an overhead of $1500 per month, requiring at least 1000 production hours before any profit could be realized, he was hiring only enough labor to produce less than 500 production hours and losing money fast though he did not know it at the time. It seemed too simple to be true, yet had he asked for the analysis of his setup in the beginning he would have saved himself a big headache and ten of his fifty grand.

There should be a moral to every story, and I think the best one for this is: "When you think you know it all and that no one can tell you anything—Look out Brother, look out."

Wm. E. Phillips
Blawnox, Pa.

•

SHOULD A FOREMAN BE COST CONSCIOUS?

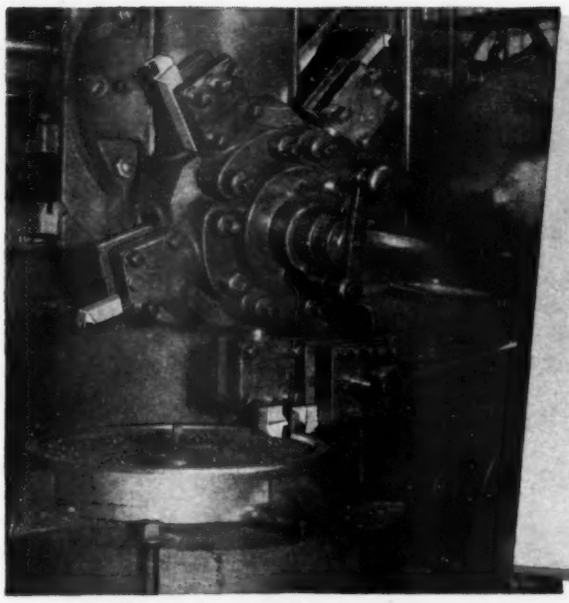
As any business concern must show some profit to enable it to continue in business, it is reasonable to look for some profit from each individual employed. The amount that can reasonably be expected from each individual should be in proportion to his responsibility, or in other words a foreman supervising 40 workmen would be responsible for double the profit of one supervising 20 workmen.

Those in the maintenance department should accomplish in value equal to average costs in like departments in similar lines of business. In fact every employee should be responsible for converting his energy into an increased value regardless of the position he is filling.

Surely a foreman should accept cost consciousness as his problem. However thoroughly a business is organized with provisions made for emergencies, there will be times when things unforeseen will occur that must be remedied by the foreman without delay—and it goes without saying with as little cost as possible.

One of the foreman's greatest helps is the establishment of fair dealing and amiability with the workmen. He cannot afford to overlook this important quality.

Martin H. Ball
Watervliet, N. Y.



5 BIG REASONS WHY CARBOLOY CEMENTED CARBIDE STANDARDS get the call IN DIESEL MANUFACTURE

In the progressive Diesel field—where boosting product efficiency, increasing output, and reducing costs are continuing objectives of front-rank importance—more and more companies are turning to Carboloy Cemented Carbides. Here's why:

1 THEY PARE COSTS
2 BOOST HOURLY OUTPUT

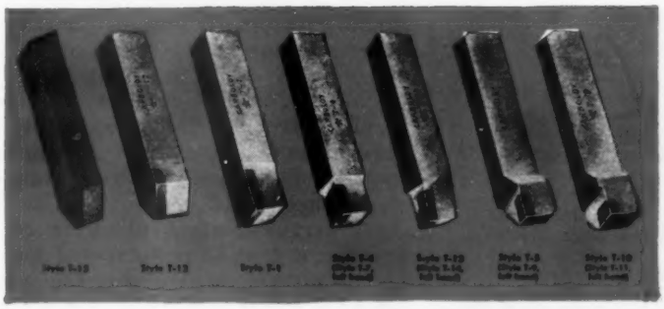
Eight single-point Carboloy* tools replaced an equal number of large, expensive core drills on one operation in Diesel engine manufacture with these results: Cost of new tooling was cut from $240 per set-up to $15. Hourly production was doubled. Direct labor cost per connecting rod was halved.

3 OUTLASTS STEEL TOOLS
4 ELIMINATE EXTRA OPERATIONS

A midwestern manufacturer of Diesel valves switched to Carboloy* Standards for machining the interiors of valve heads. A far smoother surface finish was obtained—the polishing operation was completely eliminated, with a big saving of time—and tool life was increased by 10 times.

5 AND DO THE JOBS THAT "CAN'T" BE DONE!

Recently a shipyard ran into trouble reconditioning Diesel crankshafts on ships of war. The chrome alloy used to build up undersize bearings proved too tough and abrasive for high speed steel, and diamond-pointed tools were too fragile and costly for the job. Lacking a grinder big enough for the operation, Carboloy* G-999 was recommended—machined satisfactorily at moderate tooling cost—and helped speed the needed ships back into service.



Put Carboloy* Standards to work in *your plant*, for greater stamina throughout long production runs—high piece-output-per-tool—high surface finish, almost mirror-smooth—uniformly close tolerances—cutting edge maintained longer between grinds. In every industry these 11 Standard Styles are adaptable to 60%-80% of the turning, facing and boring jobs. They are actually priced lower than ordinary tools in many sizes. Write today for Catalog GT-175R.

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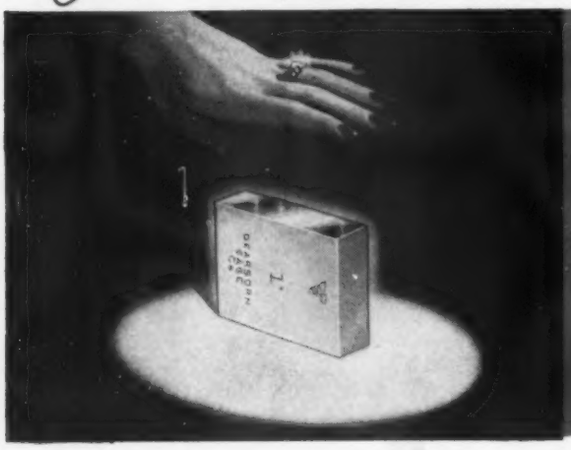
Originators of Chromium Plated Gage Blocks



LIKE A FLAWLESS DIAMOND finely cut to bring out all its brilliance and quality, each Ellstrom Chromium Plated Gage Block is made of the finest steel and finished by expert workmen to accuracies up to ±.000002 of an inch.

★

"Quotes"

Aircraft Tooling

N. A. LOMBARD, production tooling engineer of Douglas Aircraft Co., Inc., said before the ASME aviation meeting in Los Angeles, "All aircraft companies in their tooling reconversion policies have one thing in common, namely, their attempt to retain quality economically.

"We must produce tools for more complicated parts, to a predetermined limited cost budget, in a shorter time and still retain wartime accuracy and quality.

"When we speak of more complicated parts, we are referring to the natural evolution of aircraft design that must more and more meet the requirements of safety and speed in the design, and production economy in the manufacturing of the airplane.

The design trend today is toward a so-called one-piece part, that is, one that is machined from a single piece of raw material rather than an assembled part of riveted or welded sheet metal. This, of course, means less assembly labor and fewer parts to handle, and results in over-all cost reductions. This problem, like others, will be worked out in various ways by different aircraft companies.

"Generally, however, it will be done through such means as specialized machines, single-purpose machines and other types of precision machinery. This leads into the modern thought that no longer is man's productivity measured by the hours and minutes he works, but rather by the capacity and the efficiency of the machinery furnished.

"Going briefly into detailed tool-design problems, we find such things as the question of the retention of simple foolproof features without their usual high cost, the use of more and more so-called standard or universal tools, the use of Class "B" dies in place of Class "A" dies, and the development and use of machines capable of efficiently utilizing tungsten-carbide tools.

"A very important phase of our problem is that of prototype of tooling. Many airplanes during the war were put immediately into production without benefit of a prototype plane. This was only possible and expedient because it was felt that the airplane was of sufficiently proved design to warrant the risk of retooling such portions as required.

"Today, however, with the advent

YOU CAN CUT
YOUR TOOL COSTS...

by Recovering Lost Tools AND KEEPING THEM . . . *through* McCASKEY

This may sound fantastic and exaggerated, but it's a fact. Let us tell you how by quoting from the published statements of four of our users.

Here's what happened in the first plant, when installing McCaskey Tool Control in their cribs: "Our first step was to scrap obsolete and unusuable tools. A complete inventory of remaining items was taken and a notice issued requiring employees to return brass checks and tools. Results were astounding. We received better than $3000 in small tools that we neither knew had been issued, or where they were."

The second reported: "The quantity and variety of tools turned in was enormous. It was a revelation to see what the men had collected over the years. *Tools long since regarded as lost were turned in. A low estimate of the number would be 2500 to 3500 tools.*"

The third: "One of the first results of the plan (installing McCaskey) was the turning in of $2000 worth of tools, virtually a windfall, so far as practical use was concerned. It has reduced disputes and losses of tools . . . has already more than saved its cost."

The fourth stated: "We installed McCaskey at a time when tool deliveries averaged nine months or worse, hoping to cut down theft, loss and breakage that were giving us sleepless nights.

"The system was paid for twice over by the tools located out on the production floor and in employees' tool boxes and lockers. We had been sure that many of them had been stolen; that most of them were gone. Now the McCaskey tells us where our tools are and what every employee has . . . no more 'lost' tools in lockers or under machines . . . and breakage is down too."

McCaskey Tool Control does reduce tool costs in a dozen ways, some with large savings and others indirect but important. The recovery of "lost tools" actually has paid for numerous installations.

Let us have an industrial systems engineer explain how McCaskey will pay its way from the beginning in your plant . . . or send you factual reports of McCaskey savings in several plants widely recognized for their progressive management.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — ***The McCaskey Register Co., Watford, England***

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Minimum Investment - Maximum Production

NEW-FIELD *Unwersal* FLY CUTTERS

. . . ***REDUCE*** **inventory and maintenance costs.**

. . . ***SAVE ON*** **time, labor and expense.**

. . . ***BECAUSE*** **one easily adjustable New-Field Fly Cutter performs a variety of production jobs.**

FOR FLAT SURFACE - STRADDLE MILLING - SLOT CUTTING ON ALL METALS & PLASTICS

The New-Field fly cutters provide an economical and efficient means of putting your idle standard tool bits to work. Designed for high speed or carbide tool bits, the New-Field Fly Cutters provide you with a wide range of special shaped milling cutters.

NO COSTLY PRODUCTION LAGS due to broken or dulled cutters . . . simply remove the defective bit and continue operation. The New-Field Meehanite cutter bodies, developed specifically for efficient FLY-WHEEL ACTION, absorb vibration, prevent tool chatter, reduce power requirements and increase cutter life.

MORE CHIP REMOVAL per horsepower with New-Field Fly Cutters. Regular models; 4" to 10" diameters—⅝" to 1" widths. Extra Heavy 6" and 8" diameters—1-3/8" width.

Write for descriptive bulletin.

NEW-FIELD MACHINED PARTS CO.
General Offices: 549 W. Randolph St., Chicago 6, Ill.
Factory: 210 West 7th St., Los Angeles 14, Calif.
Export Division: 80 Broad St., New York 4, N. Y.

THE TREND IS TO NEW-FIELD

of radical and frequent changes in designs, the disk is too great and we must revert to preliminary prototype tooling, but definitely not to the same technique. Prototype tooling now must be a very carefully analyzed program based on a combination of prototype and production tooling.

"Wherever possible or feasible, permanent tooling must be provided in the beginning, while the special prototype tooling furnished should be of such a type that it can be reworked, or added to, without destruction of the original. A program of this type is necessary in order that the time element between the prototype and the first production model will be reduced as much as possible. In the past few years, various types of specialists and project men have been trained to plan along these lines, and they now must be utilized to the fullest extent."

•

How Oils Are Purchased

AT A SYMPOSIUM on oil-procurement practices, sponsored by the American Society for Testing Materials in Buffalo, Christian Dantsizen had this to say about General Electric's policy:

"Oils purchased are divided into three groups:

Group 1—Lubricating oils used on equipment in General Electric factories. These oils cover a range from general-purpose machine oils to special oils such as those used in company-operated steam turbines.

Group 2—Special oils used with equipment such as electric refrigerators, transformers and cables.

Group 3—Oils specified by brand-name by manufacturers of machine tools.

The following are the steps in the procedure in purchasing oils in groups 1 and 2:

(*a*) Laboratory tests on samples submitted by vendors are carried out to determine whether such samples pass certain specifications.

(*b*) Trial orders are placed to determine which of the oils passing laboratory tests perform satisfactorily in service. Those passing are given laboratory approval in group 1; engineering approval in group 2.

(*c*) Confidential lists of oil products approved under (*b*) are set up by the purchasing department.

(*d*) The purchasing department requests quotations from vendors of approved oils.

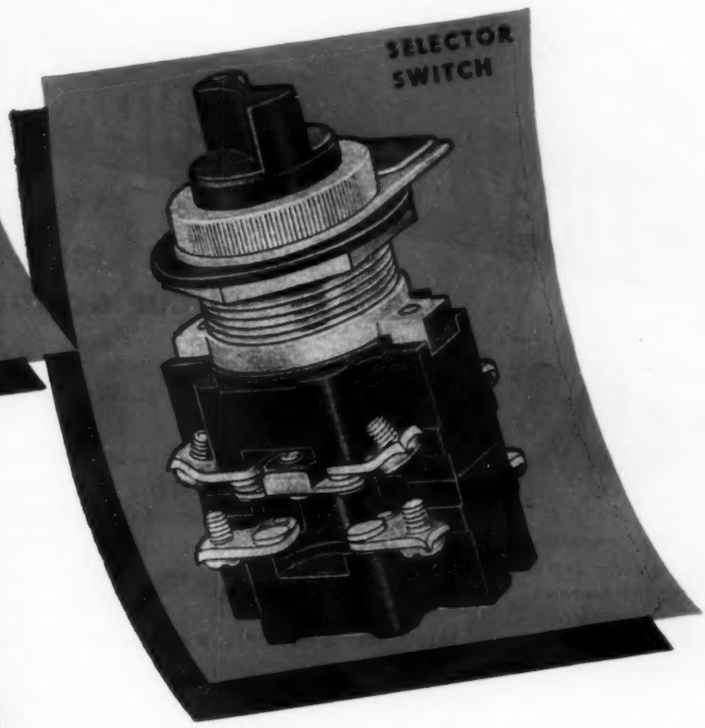
(*e*) After taking into consideration quotations, service data, and results of laboratory tests, orders are placed.

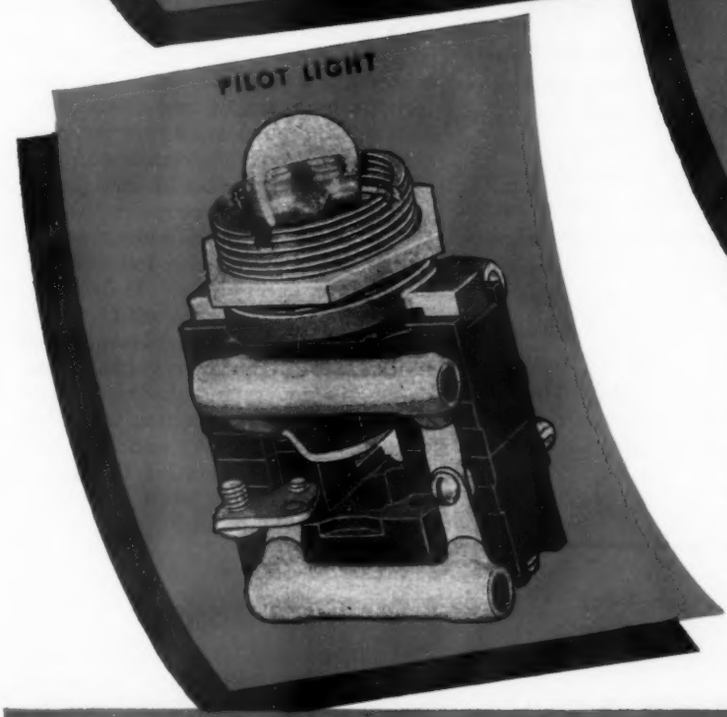
A specification under (*a*) is really a screening specification in that it

Another "3C" Achievement!

PERMANENTLY OIL TIGHT PUSH BUTTON, PILOT LIGHTS *and* SELECTOR SWITCHES *for use on Machine Tools*

Now you can avoid fouling contacts from seepage of oil or cutting compounds with these new "3C" developed Push Button Elements, Pilot Lights and Selector Switches that are *entirely oil tight*. A steel faced oil-tight washer is held snugly against both front and rear of the panel by close fitting nuts. An oil-tight boot closely grips the button, effectively sealing it against leakage.





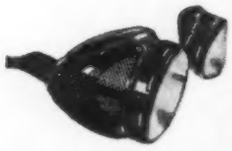
These heavy-duty Type DO units have the same basic elements as the "3C" Type "D" units which have established such excellent records in heavy-duty use. Push Buttons and Selector Switches feature Silver-to-Silver Double Break Contacts. All units have large, easily accessible terminals that simplify wiring. Selector Switch permits 2 or 3 position operation. Vertical mounting is standard, but all units are adaptable to horizontal mounting. Mushroom head available for Push Button. Color caps for Pilot Lights are available in Red, Green, Amber, Blue, Clear and White.

Write for full information.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

PROTECT EYES WITH
WILLSON CUP GOGGLES



Two way ventilation inside lens through side screen and slotted ring keeps fogging to minimum.

The tougher the job, the more your men will appreciate the dependable protection of WILLSON RR50 cup goggles.

Heat treated Super-Tough* lenses in durable plastic eye cups, provide both front and side protection against steel chips, splashes of molten metal and similar hazards encountered in chipping, riveting, casting and such occupations. A specially designed resilient spacer ring under the lens provides a greater factor of safety when the lens is subjected to severe impact.

For utmost comfort in a goggle of this type, the eye cups are molded to fit the eye cavities. The nose bridge can be adjusted for correct spacing between the eye cups and does not ride the nose, while snug fit without pressure is assured by an adjustable headband. Dual ventilation gives through draft by means of a perforated sideshield, and over the lens surface through a slotted retaining ring.

*T.M. Reg. U. S. Pat. Off.

For help on eye protection problems get in touch with your Willson distributor or write direct to Willson Products, Inc., 235 Washington St., Reading, Pa.

WILLSON 75 YEARS

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA., U.S.A. Established 1870

screens out some oils from passing on to (*b*). Screening specifications are established through years of experience in using lubricants and in keeping up to date with new developments in the field of lubricants.

In drawing up oil specifications, and in continuously bringing such specifications up to date, laboratory and purchasing personnel keep in constant touch with oil companies' experts and other representatives. Results of research and development of many competitive oil companies are learned as soon as such information is released.

•

Engineer of Human Relations

Steven G. Garry of Caterpillar Tractor Co., speaking at the annual meeting of the American Foundrymen's Association, had this to say about training foremen, whom he called the engineers of human relations:

"The supervisor," he maintained, "cannot help but develop poise and personality when trained to take an interest in people. He learns self-control. He builds up, by practice, the habit of censoring anger at its inception, to develop strong standards of poise and self-control in all dealings. He can learn to recognize that when he feels hot about the eyes, or tingling with indignation, there is trouble ahead unless he gives himself time to cool off.

"Development of a supervisor's leadership and, incidentally, his personality by changing and altering his habits is the purpose of foremen conferences. Properly organized, the training program should enable the supervisor to : (1) recognize the nature and extent of individual differences; (2) recognize his influence on the actions of his men; (3) learn to observe the increasing effectiveness resulting from taking advantage of individual differences in getting work done; (4) understand the nature and method of the functioning of group attitudes and morale; and (5) understand the influence of the group attitude and morale upon individual members of the group."

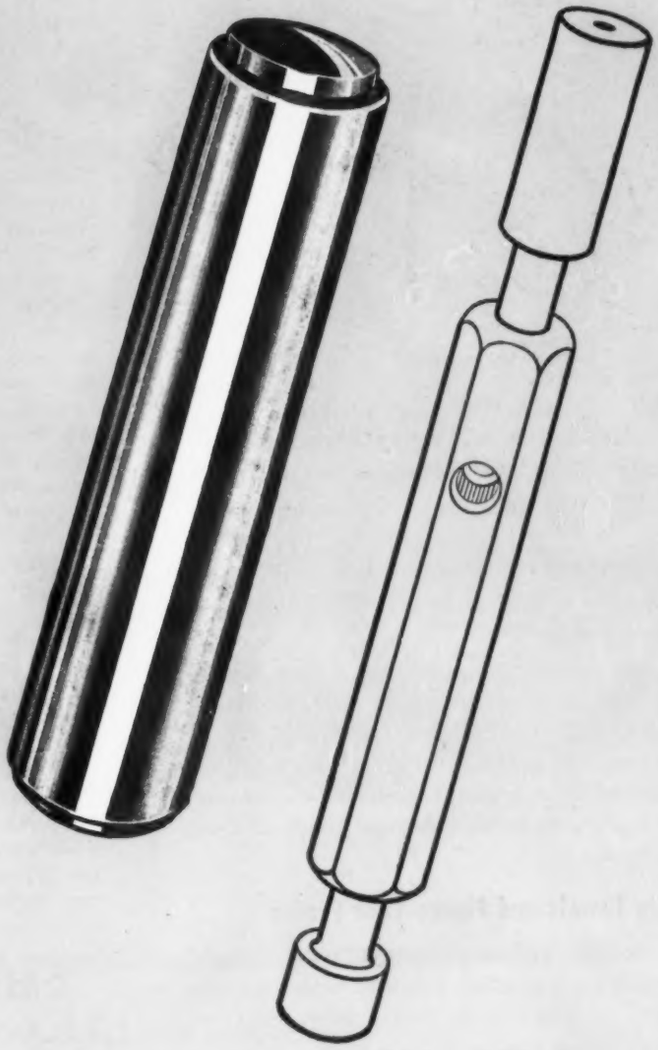
•

"Flame Spinning"

By adding heat from oxyacetylene flames, speed and range of metals which can be spun have been increased. The altered process, dubbed "flame spinning," was first used in forming hand grenades, bombs, fuse housings and similar parts from heavy tubing. If very heavy (3/16 in. thickness and over) or very large (over

PISTON PINS

...accuracies in millionths!



BELL *ENGINEERING*

KNOXVILLE, TENNESSEE

BLINDFOLDED

it's easy to pick the right wiper!

Try the blindfold test on KEX Industrial Wiping Towels and ordinary rags or waste. Just by touch, choose the wiper *you* would use.

Feel how rough and scratchy the ordinary rags and waste are. What a lot of damage *they'd* do on delicate surfaces! Now pick up a KEX Wiping Towel. Easy to tell the difference, isn't it? Feel that springy KEX s-o-f-t-n-e-s-s. No scratching, no possibility of wearing grooves in soft metal by foreign matter.

That's not all, though. Every square inch of a KEX Wiping Towel is *wiping* surface . . . hundreds of more wipes per pound over ordinary waste or rags. KEX Industrial Wiping Towels are uniform in size—distribution is easier to control. And fresh KEX Wiping Towels—chemically cleaned by a *special* high-heat process—are delivered to your plant as often as needed. Always plenty of clean KEX Wiping Towels on hand.

Rent KEX Wiping Towels and Figure Your Profits

Try the KEX Wiping Towel Rental System, today. There's nothing to buy, no expensive inventory—just a low monthly rental. And the very first month should show considerable saving on wiping costs. For complete information, phone your local KEX representative—or write KEX National Service, 295 Fifth Ave., New York 16, N.Y.

"KEX" NATIONAL SERVICE
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"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

4 in. OD) tubing is to be formed, the piece is preheated in a furnace, then held at plastic temperature with the oxyacetylene flame.

Flame spinning can be used on tubing with diameter-wall thickness ratios of 50:1 or less; greater ratios permit tube deformation. Flame heads have 7 to 30 flames, depending on the job, and tools should be hard-surfaced with a heat-resisting alloy. For tubes up to 2 in. OD, a 3-hp. motor supplies necessary rotative power, for 3- and 4-in., a 10 hp.

Current applications are in forming gas cylinders, shock-absorber housings, parts for refrigerating units and chemical converters, some with sealed ends.—*The Welding Engineer.*

•

The Market is the Thing

Morehead Patterson, American Machine & Foundry Company, New York, speaking before the ASME on "Exploring the Market," brought out an interesting point:

"Two years ago in Washington a friend of mine who represented a company heavily engaged in war work came to me and said, 'My company is searching for new products. We have a plant in Rahway, N. J., which has been expanded to seven times the size of our original plant. We know that our peacetime business will fill only one-seventh of the present plant. What would you do under the circumstances?'

"He obviously thought I was facetious when I said, 'The first thing I would do is to tear down all of the plant that you do not need for your regular peacetime production.'

"But I was serious, for I believe that *the first and most important thing is the market,* and that it is crippling to the right-thinking to start with existing production facilities as the primary basis for the selection of new products."

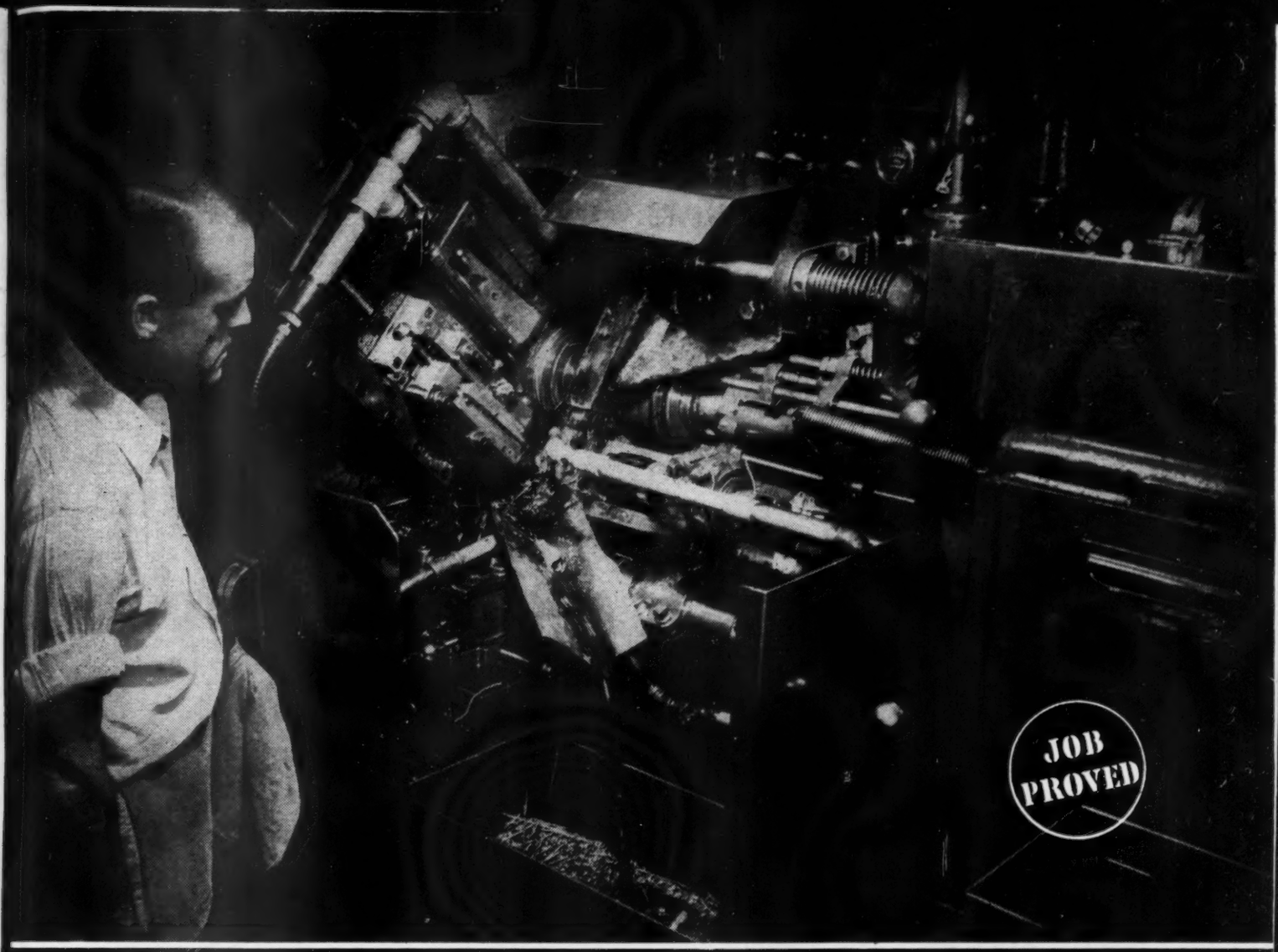
•

Cracked Carbide Tips Worked

J. F. ALLEN of Warner & Swasey Co., Cleveland, recently told of an interesting experiment with very hard cemented-carbide tips, which were removing 22 cu. in. of brass per min.

The original method was to use a sandwich braze. It was found that when the tip got hot the sandwich would become mushy and the tips would crack. After they cracked, no more trouble was experienced for a long while, until tips finally broke off.

It was decided to try to get the same results when brazing. Results have



Tapping AND *Threading* S.A.E. 4140 STEEL

SUNICUT . . .

Makes possible fast production of fine threads

Here's an operation where Sunicut helped produce fine-finish threads on tough steel at relatively high speed.

Type of Machine: New Britain Gridley automatic screw machine, 2" capacity, No. 61, six spindles.

Metal. S.A.E. 4140 bar stock.
Operation: Forming, drilling, tapping, and threading.
Speed: 85 SFPM

SUNICUT is a free-flowing, transparent, correctly balanced sulphur, lard, and mineral oil combination. It has been "Job-Proved" in hundreds of shops. For additional proof of what Sunicut can do for you, test it in your own shop under your own operating conditions!

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INDUSTRIAL PRODUCTS

YOU GET MORE FROM A LUFKIN MASTER PLANER GAGE
THE TOOL OF 101 USES
SLIDE AND BASE ARE ACCURATELY FITTED
One of the most valuable, versatile tools in the modern machine shop. The Lufkin Master Planer Gage can be set to micrometer accuracy from ¼" to 9". Adaptable to scores of gaging operations. Buy Lufkin Master Planer Gages from your distributor. Write for free catalog. THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.
LUFKIN FOR ACCURACY
BUY THROUGH YOUR DISTRIBUTOR

been satisfactory. The front two-thirds of the tip surface is "mussed-up" with printing ink so it will not braze. The brazing only holds the back third to the shank. These tips have not cracked in severe service.

•

Permanent Mold Casting of Aluminum Alloys

IN CASTING aluminum alloys in permanent molds, Foundry Services, Inc., says in its publication "Fluxuations" that particular attention must be paid to the following requirements:

(a) Heavy runners and risers are necessary. "Heavy" in this connection refers to cross-sectional area, not height. Provision must be made for adequate feeding of all thick sections, particularly bosses.

(b) The die should be kept as hot as possible, preferably by quick working. In some cases it is advantageous to maintain temperature by means of external heat, such as gas burners.

(c) Pouring temperature must be kept low—if misruns occur, the remedy is not hotter metal but a hotter die, with perhaps, an increased gate opening.

Die Coatings

Diecoats play an important part in the production of permanent mold castings. This means coating the casting cavity with a more or less refractory material. For coating purposes, runners and risers are considered part of the casting cavity, also the ends of cores, bushes, plugs and slides which form parts of the casting. In short, any surface of the mold which comes in contact with molten metal must be coated.

All new dies, when leaving the toolroom, should be heated to 450 F. for a period of not less than four to six hours, to eliminate all grease, oil and other matter which may be on the working surfaces. This grease will prevent adhesion of the die coating. The die coating should be evenly distributed over the mold form.

•

Hydro-Submerged Arc Welding Proved for Difficult Weldments

One wartime welding development, that will be probably added to the many useful techniques already serving as tools for other than their original purposes, is hydro-submerged arc welding. The practicability of welding under water has been proved by a number of war applications, notably underwater plate repairs on damaged vessels.

The use of electrodes with special water-impervious coatings and water-

Brutes for Strength

1 ***Greatest Shock Absorbing Capacity*** of any type single-row bearing. Here's the secret: Norma-Hoffmann Precision Roller Bearings provide full line contact between rollers and races. That means you get, size for size, a maximum area to support shock load.

2 ***Handles Up to 50% Overload*** Full line contact, the design feature of these bearings, also provides ample margin for severe temporary overloads.

3 ***Lowest Coefficient of Friction*** under heavy load of any type bearing, plus unsurpassed speedability. These important benefits are a result of Norma-Hoffmann's 100% machined bronze retainer, precision workmanship and short, parallel roller design.

When the going is so tough no other anti-friction bearing will stand up—use Norma-Hoffmann Precision Roller Bearings. You will continue to get dependable service under critically severe conditions of speed, load, shock and vibration. These bearings are precision-made to unusually exacting tolerances and are backed by years and years of proved performance. Norma-Hoffmann Bearings Corporation, Stamford, Conn.

"NORMA-HOFFMANN"

Precision Ball, Roller and Thrust Bearings

FIELD OFFICES: NEW YORK, CHICAGO, CLEVELAND, DETROIT, PITTSBURGH, CINCINNATI, LOS ANGELES, SAN FRANCISCO, PORTLAND, ORE., SEATTLE, PHOENIX

Combat Rising Costs....

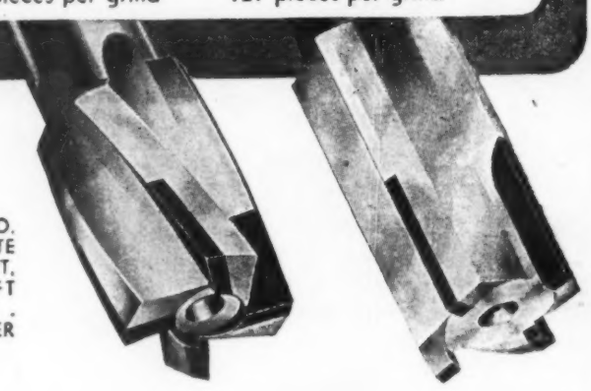
with WENDT-SONIS Carbide Tipped END MILLS

PRODUCTION DATA REPORT

WORK: Milling 5/8"+ (.625) slot 1/4" (.250) deep and 12" long in cast iron on a Kearney Trecker vertical milling machine.

TOOLS: H.S.S. six flute end mill.
Wendt-Sonis carbide tipped four flute end mill.

	WITH H. S. S.	WITH WENDT-SONIS
SPEED:	480 rpm.	900 rpm.
FEED:	5 1/2 in. per min.	12 1/2 in. per min.
RESULTS:	19 pieces per grind	127 pieces per grind



AVAILABLE IN TWO, FOUR AND SIX FLUTE DESIGNS . . STRAIGHT, RIGHT AND LEFT HAND SPIRALS . . . STRAIGHT AND TAPER SHANKS.

Wendt-Sonis End Mills are available for immediate shipment with the correct grades of carbide for milling steel, malleable, cast iron, non-ferrous and non-metallic materials. These carbide tools are exclusive W-S designs. All shanks are scientifically hardened. More cubic inches of stock can be removed per minute. Can be resharpened repeatedly. Wendt-Sonis End Mills will make your production problems easier — help combat rising costs. Get complete details on W-S Carbide Tipped End Mills for use on your work. WENDT-SONIS COMPANY, Hannibal, Missouri, (Tel. LD6), and 580 North Prairie Ave., Hawthorne, California, (Tel. Oregon 8-2655).

WENDT SONIS

CARBIDE CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

proofed leads are the only variations required in standard welding equipment. Electrodes can be composed of any standard alloy or steel regularly utilized for welding in air. Safety equipment to protect the operator from water-conducted currents consists of gloves and other coverings for parts of the body submerged while welding. This covering must be made of dielectric materials and fully waterproofed.

All welds possible to make in air are possible when submerged. In addition, vertical and overhead welds are actually made with greater ease than equivalent welds made in air.

The underwater arc is not protected from the atmosphere to an extent greater than an air-exposed arc, as the coating gives full protection whether exposed or not, but the excess heat of the arc is more easily dissipated to water than to air.

This effect of hydro-submerged arc welding will be advantageous to the welding of large masses that usually require considerable preheating to prevent distortion and cracking outside the welded area. Excessive heat of areas surrounding the welded section will be dissipated to a large volume of water, or, if the tank size is to be kept small, the cooling water can be recirculated to a cooling storage tank.

Looks like the welder of the future may become an amphibious creature nurturing the companionship of a pet electric eel in his spare moments.

•

Gates and Risers

DIE DESIGN, in relation to the alloy to be used, is mostly a question of runners and risers. Castings in aluminum-silicon alloys can be poured successfully through narrow gates and small runners situated at the top of the mold. Other types of alloys usually require one or more risers in addition to the runner, with the latter placed at the casting's heaviest section. Although gates ought to be placed on edges or faces where they can be easily removed, it is even more important that they be placed at those positions which enable good castings to be produced. It is a great mistake so to position a gate solely because its removal is simple, and without regard to other and more vital consideration such as feeding of bosses, avoidance of turbulent metal entry and possibility of blowholes due to air traps.

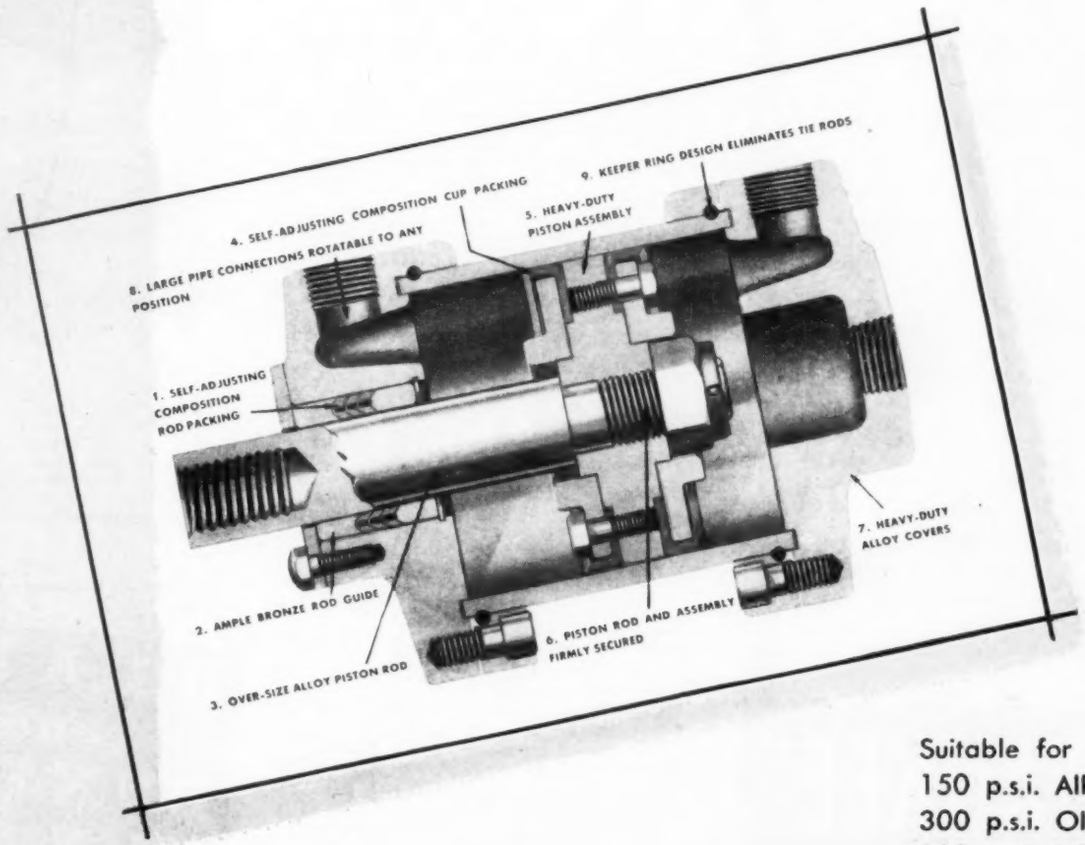
Cross-sectional area of a runner or riser is important. If not massive enough, it will fail to perform its proper function of remaining liquid and providing a reservoir of molten

GEROTOR AIR CYLINDERS

• double-acting • non-rotating • standard or cushioned

Engineered and manufactured to assure long life at top efficiency, Gerotor Air Cylinders are available in eleven bore diameters, in any length stroke, and in seven standard mountings: rabbet, foot, trunnion, center-line, blind end flange, rod end flange and clevis.

Whether your operating requirements are standard or special, there is a Gerotor May Air Cylinder to do the job **right**. Write for descriptive literature and specific recommendations to fit your needs.


8. LARGE PIPE CONNECTIONS ROTATABLE TO ANY POSITION
4. SELF-ADJUSTING COMPOSITION CUP PACKING
9. KEEPER RING DESIGN ELIMINATES TIE RODS
5. HEAVY-DUTY PISTON ASSEMBLY
1. SELF-ADJUSTING COMPOSITION ROD PACKING
7. HEAVY-DUTY ALLOY COVERS
2. AMPLE BRONZE ROD GUIDE
6. PISTON ROD AND ASSEMBLY FIRMLY SECURED
3. OVER-SIZE ALLOY PISTON ROD

Suitable for
150 p.s.i. AIR
300 p.s.i. OIL
300 p.s.i. WATER

GEROTOR MAY CORPORATION • Baltimore 3, Md.

No. 1993 "Yankee" Vise

"YANKEE"

VISE

WITH SWIVEL BASE FOR BENCH AND MACHINE

Removed from its swivel base, a "Yankee" Vise can be used in practically any position. Suppose you have a job in the vise and you want to transfer that work to the drill press or milling machine. Simply detach the vise from its base, do the other operations, bring the vise back to the bench, put it back on its swivel. You have maintained correct alignment from start to finish without disturbing the work. You have avoided time-consuming set-ups for each operation.

"Yankee" Vises with swivel bases are made in four sizes, with a jaw opening from 1½" to 4". Each comes equipped with a grooved V-block for holding round or irregular work. The time- and labor-saving feature of these vises is typical of *all* "Yankee" tools—screw drivers, braces, and drills. Order from your industrial supply distributor, or write direct to Dept. A-M 846.

NORTH BROS. MFG. CO.
Phila. 33, U. S. A.
Established 1880
Division of The Stanley Works
Send for the "Yankee" Tool Book

"YANKEE" TOOLS

metal from which the casting proper may draw. Shrinks and cracks will result. On the other hand, it is uneconomical to go to the extreme of relying on very heavy sections in every case, because production is seriously retarded if the operator must wait an appreciable length of time after each cast before the mold can be opened. It is good practice to start off with runners, rather smaller than one's experience or judgment deems advisable, then increase gradually after a few trials until they prove just large enough to produce the desired results.

•

A Mnemonic For PI

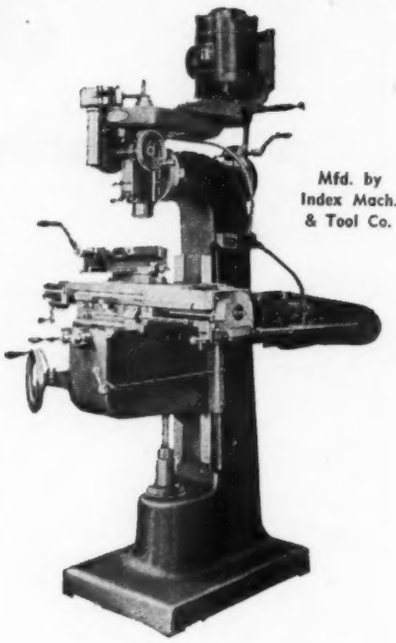
BY LEE L. DODDS

IN THESE DAYS of measurements extended to hundreds of millionths of an inch, it behooves us to learn the value of pi a little further than four decimal points. The following mnemonic has been worked out to eighty points and you can memorize it as far as you like. It is easier to memorize words than figures. You will note that the number of letters in each word corresponds to the digit in the right-hand column, with the exception, that zero is represented by ten-letter words. These digits, taken in succession, represent the value of pi to eighty decimal points.

Yea, I will a query undertake	3. 1 4 1 5 9
to unfold: since the great	2 6 5 3 5
historic Syracusan, supreme, elemental, has	8 9 7 9 3
in his inherent lore, passed	2 3 8 4 6
on before, left man his	2 6 4 3 3
guidance how to—circles calculate.	8 3 2 7 9
Where, unsolvable Pi, nebulous infinity,	5 0 2 8 8
will I establish contact? I	4 1 9 7 1
wonder, Syracusan, can immortals ascertain	6 9 3 9 9
the correct ratio? I deliberate,	3 7 5 1 0
might cowardly be, delectable Syracusan	5 8 2 0 9
working here, trembling, lest your	7 4 9 4 4
worth confounds my eye. Archimedes,	5 9 2 3 0
teacher glorious, I wonder what,	7 8 1 6 4
monumental master, we earthmen should	0 6 2 8 6
do? Archimedes, immortal, unrivaled Syracusan.	2 0 8 9 9

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

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JACKSON, MICH.

FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 SPECIAL MACHINERY, CONTRACT WORK—The Fuller Brush Co., Hartford, Conn. 40-page book "Fuller Designed and Built" illustrates the production facilities, Engineering Department, and Machine Tool and Gage Division. Large illustrations in this elaborate publication show the modern facilities and equipment, illustrate some of the special machines built, and the contract work done.

2 HYDRAULIC ARBOR PRESSES—K. R. Wilson, Buffalo, N. Y. 32-page catalog covers hand-, air-, and motor-powered hydraulic arbor presses. Detailed photographs and drawings are included with description and specifications for each model.

3 AUTOMATIC CONTROL FOR MILLER—Pond Engineering Co., Springfield, Mass. 4-page bulletin describes Pond Operator No. 200 for use with milling machines. The operator automatically controls opening vise, ejecting finished piece, locating bar for next cut, and starting machine cycle.

4 VERTICAL TURRET MILLS—Rogers Machine Works, Inc., Buffalo 7, N. Y. 12-page bulletin describes "Perfect 36" vertical turret mills. An adjustable five-position main vertical turret provides tool settings permitting boring, drilling, reaming, turning and thread cutting.

5 PROFILERS—Pines Engineering Co., Inc., Aurora, Ill. 8-page bulletin describes profilers for manual or automatic operation, single or double spindle, air or hydraulic operation. The tool rotates and the work is chucked in a stationary position.

6 DIE-LESS DUPLICATING—O'Neil-Irwin Manufacturing Co., Minneapolis 15, Minn. 30-page catalog No. 46-10 describes Di-Acro line of benders, brakes, and shears and the method of using these units for production runs on duplicating metal stampings.

7 PLANERS—Liberty Planers, Hamilton, Ohio. 21-page catalog No. 157 covers heavy-duty fast-operating planers, including double-housing, open-side convertible, and die block planers. Many illustrations show application of the planers to various jobs.

8 POWER SHEARS—The Cleveland Crane & Engineering Co., Wickliffe, Ohio. 8-page bulletin cover Steelweld pivoted-blade shears. The upper knife travels in a circular path, turning on pivot pins, with guides and slides eliminated.

9 VARI-SPEED LATHE—Precise Products Co., Racine, Wis. 2-page bulletin describes lathes for deburring, finishing, and polishing small screw machine parts, precision castings, and carbide tools and blanks.

10 TOOL GRINDER—E. M. Hager and Son, Queens Village 9, N. Y. 8-page bulletin describes typical grinding set-ups with attachments for the Hager Carbide Tool Grinder. Each set-up is illustrated and briefly described.

11 OXYACETYLENE CUTTING—The Air Reduction Sales Co., New York 17, N. Y. Bulletin describes Airco Camographs Nos. 4 and 5 giving specifications, operating instructions, and electrical requirements. Includes color diagrams of cutting ranges.

12 SHOT PEENING—Pangborn Corp., Hagerstown, Md. 16-page bulletin describes applications and gives performance data on the use of shot peening for increasing fatigue life of metal parts. Development of the process is discussed in detail and equipment used is described.

TOOLS AND ACCESSORIES

13 CUTTING TOOLS—Delloy Metal Corp., Philadelphia 24, Pa. 24-page catalog covers general-purpose, cast alloy and carbide toolbits. General descriptions of each type with specifications and prices are included. Includes cutting speed data.

14 COOLANT FILTER—Cuno Engineering Corp., Meriden, Conn. 4-page bulletin No. 3110 describes Coolant-Klean Filter Model 431 designed especially for grinder coolants. Intended for precision grinding, the filter can be applied to any type of grinder or almost any machine using a coolant.

15 TAILORED TAPS—Dowding Division, Henry L. Hanson Co., North Attleboro, Mass. 10-page catalog No. 101 lists standard taps and dies which are tailored to suit the specific applications. This is said to deliver trouble-free service and frequently results in production increases.

16 CARBIDE GRINDERS—William Sellers & Co., Philadelphia 30, Pa. 4-page bulletin describes No. 3 carbide toolbit grinders for grinding milling cutter toolbits. Narrow line of contact between the wheel and work allows a high unit pressure that is said to assure rapid grinding.

17 GRINDING WHEELS—Mid-West Abrasive Co., Owosso, Mich. 94-page book "Grinding Wheel Information" gives much general information about the development of the grinding wheel, characteristics and selection, and the various types of grinding operations. Recommended grain and grade specifications for any type of grinding operation.

18 TOOLMAKER MICROSCOPE—The Gaertner Scientific Corp., Chicago 14, Ill. 8-page bulletin 155-64 describes the large toolmaker microscope which has a microscope with a protractor head, a support column with adjustable tilt, and a mechanical stage permitting longitudinal, cross motion, and angular measurements.

19 MILLING MACHINE TOOL—Leo G. Brown Engineering Co., Los Angeles 31, Calif. 4-page bulletin covers all universal precision high-speed milling machine tools. The tool is designed for installation in most smaller milling machines for angular operation.

20 MACHINERY MOUNTINGS—Bushings, Inc., Royal Oak, Mich. 8-page bulletin describes "Vibro-Levelers" which are mountings designed to stop transmission of vibration as well as provide a means of levelling.

21 CUTTING TOOLS—Eclipse Counterbore Co., Detroit, Mich. Catalog covers complete line of production end cutting tools, including carbide-tipped cutters, special holders and drives, balanced drive inverted spot facers, Welch plug cutters, and core drills. Complete counterbore sets are described in detail.

22 ELECTRONICS—Westinghouse Lamp Division, Electronic Tube Sales Department, Bloomfield, N. J. 28-page booklet "The Business Man's Guide to Electronics" explains the six fundamental functions of electronic tubes, rectifying, amplifying, generating, controlling, counting and sorting, and inspecting. Suggests electronic application to speed production, save time and materials, and promote safety.

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FREE LITERATURE

23 TOOL GRINDING FIXTURE — George Scherr Co., Inc., New York 12, N. Y. 4-page bulletin describes new tool grinding fixture. Illustrations show various tool grinding set-ups.

24 TOOLBITS—Crucible Steel Company of America, New York 17, N. Y. 8-page folder covers Rex high speed toolbits, describing the five brands available with their characteristics and applications, and gives stock list of sizes available. Includes suggestions on toolbit grinding.

25 COUNTERBORES AND SPOTFACERS —National Twist Drill & Tool Co., Rochester, Mich. 24-page catalog covers spline-taper drive heavy duty counterboring tools and inverted spotfacers. Changes made in the pilot-locking feature are described.

26 ELECTROLIZING — Tool Electrolizing Co., Providence 1, R. I. 6-page folder describes process that combines high voltage with a chemical bath and a rare metal to produce a hard case on the cutting edges of tools.

27 INTERFERENCE VIEWER—The Optron Laboratory, Dayton 6, Ohio. 6-page bulletin defines instruments for making optical interference measurements in which the surface is illuminated and viewed on a line perpendicular to the surface.

28 TOOLS—George F. Marchant Co., Chicago, Ill. Catalog No. 46 describes punches, dies, couplings, rivet sets, and other tools. Sketches give full dimensional details and illustrate the various tools.

29 PNEUMATIC TOOLS—Keller Tool Co., Grand Haven, Mich. Catalog covers line of pneumatic tools, including illustrations of the tools and their applications, and capacity and specification tables.

HEAT-TREATING AND WELDING

30 COLD TREATMENT—Bowser, Inc., Refrigeration Division, Terryville, Conn. 4-page bulletin describes Bowser's "Kold-Hold." The unit holds a temperature as low as —150 F. Includes data on thermal properties of materials and a temperature conversion table.

31 SPOT WELDING—Tweezer-Weld Corp., Newark 2, N. J. 4-page bulletin describes a machine which performs spot welding with a pair of tweezers. With an auxiliary booster the unit will handle elements up to ⅛ in. round.

32 PYROMETER SUPPLIES—The Brown Instrument Co., Accessories and Supplies Div., Philadelphia 44, Pa. 40-page Buyers' Guide No. 100-1 contains complete descriptions and prices on various types of standard thermocouples for applications in all industries.

33 HEAT TREATING — Carnegie - Illinois Steel Corp., Pittsburgh 19, Pa. 54-page book "Suiting the Heat Treatment to the Job" discusses the fundamentals of heat treatment. Half of the book is devoted to factors concerning hardness, and the remainder to toughness.

34 FURNACES—W. S. Rockwell Co., Fairfield, Conn. 4-page bulletin describes pusher-type furnaces. Furnaces are electric, gas, or oil. Many illustrations show various specific applications.

35 WELDING ELECTRODES — Metal & Thermit Corp., New York 5, N. Y. 16-page bulletin describes Murex Type HTS, a lime-ferritic electrode which will weld successfully such materials as the high sulphur free machining steels used in mold and die work, high carbon steels, cold rolled steels and cast iron.

PLANT SERVICE EQUIPMENT

36 MATERIALS HANDLING—Market Forge Co., Everett 49, Mass. 8-page bulletin No. 1003 MH describes standardized load carriers. Six variations, using interchangeable parts, are possible. Photographs and drawings of each variation are given with specifications and prices.

37 MATERIAL RACKS—American Machine & Foundry Co., New York 17, N. Y. 4-page bulletin describes automatic material racks in which frames hold the material at operator's level. As parts are removed, the same working level is maintained.

38 DUST COLLECTOR — Ideal Industries, Inc., Sycamore, Ill. 4-page bulletin describes dust collectors for installation on grinders, buffers, sanders, polishers, lathes and other machines.

39 METAL CLEANING — Optimus Equipment Co., Matawan, N. J. 8-page bulletin No. 6E1 illustrates and describes several types of metal parts cleaning machines. Method of operation is described.

40 ELECTRONIC CONTROL—The Ripley Co., Torrington, Conn. 44-page catalog includes bulletins describing various electronic lighting controls, including photo-electric controls and scanners, electronic switches and test equipment. Illustrated with photographs and drawings.

41 CHAIN CONVEYORS — Lamson Corp., Syracuse 1, N. Y. 20-page bulletin describes overhead chain conveyors and includes illustrations of applications. Diagrams show how many installations are adapted to particular requirements.

PARTS AND MATERIALS

42 FLEXIBLE METAL TUBING—Pennsylvania Flexible Metallic Tubing Co., Philadelphia 42, Pa. 8-page bulletin No. 90 describes Penflex Weld high pressure flexible all-metal tubing. This tubing is said to be 100% seep-proof. Cutaway views show construction of the various types.

43 FASTENERS—Shakeproof, Inc., Chicago 39, Ill. 8-page bulletin No. S-75 describes Q-Two fasteners for removable and hinged panels.

44 PLYMETL — Haskelite Manufacturing Corp., Grand Rapids 2, Mich. 20-page booklet "Plymetl a material of opportunities" describes metal-clad plywood. The different versions of this material are illustrated and described and numerous applications illustrated.

45 LOCKING DEVICES—P. & F. Corbin Div., The American Hardware Corp., New Britain, Conn. 32-page catalog K 396 describes locking devices, and special hardware for metal application. All are illustrated and many include dimensional drawings. Descriptions and specifications are given for each item.

46 GAGE COCKS — Yarnall-Waring Co., Philadelphia 8, Pa. 4-page bulletin WG-1815 describes Sealtite try-cocks for checking water level in boilers. Lever-operated and weight-operated types are shown.

47 HANDWHEEL — Gibbons Manufacturing Co., Worcester 1, Mass. 4-page bulletin describes safety handwheel for installation on machine tools and other equipment. The safety handle releases automatically when power is applied.

48 FINGERPRINT REMOVER — Freedom-Valvoline Oil Co., Freedom, Pa. 1-page product information bulletin No. 105 describes Tectyl 472 a combination fingerprint suppressor, fingerprint remover, and temporary rust preventive. The material can be applied by dip, spray, or brush.

49 SEAMLESS TUBING—The Ohio Seamless Tube Co., Shelby, Ohio. 34-page technical handbook No. M-1 describes various types of seamless mechanical tubing made of carbon and alloy steels. Includes data on chemical analyses, tolerances, machining practice, and testing methods.

50 LUBRICANT—The White & Bagley Co., Worcester, Mass. 4-page folder describes "1888," a lubricant for grinding and cutting. It is a fluid-type water-soluble lubricant.

51 RIVNUT—The B. F. Goodrich Co., Akron, Ohio. 12-page folder "Why A Rivet Went Nuts" describes a one-piece internally threaded and counterbored tubular rivet which can be upset or headed from one side and used as a rivet, nut plate or both.

52 MOTORS—Jack & Heintz Precision Industries, Inc., Cleveland 1, Ohio. 4-page bulletin describes Type C2 fractional horsepower induction motors. Motors are single phase, capacitor start, constant speed.

MISCELLANEOUS

53 SPECIAL MACHINERY—Hydraulic Machinery, Inc., Dearborn, Mich. 8-page bulletin describes engineering, laboratory, and production departments and illustrates typical examples of special and hydraulic machinery, test equipment, and hydraulic power units.

54 METAL FABRICATOR — Hungerford Corp., Big Flats, N. Y. 16-page booklet describes metal-fabrication services. Illustrations show the equipment and a variety of items produced.

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—WITH MEN
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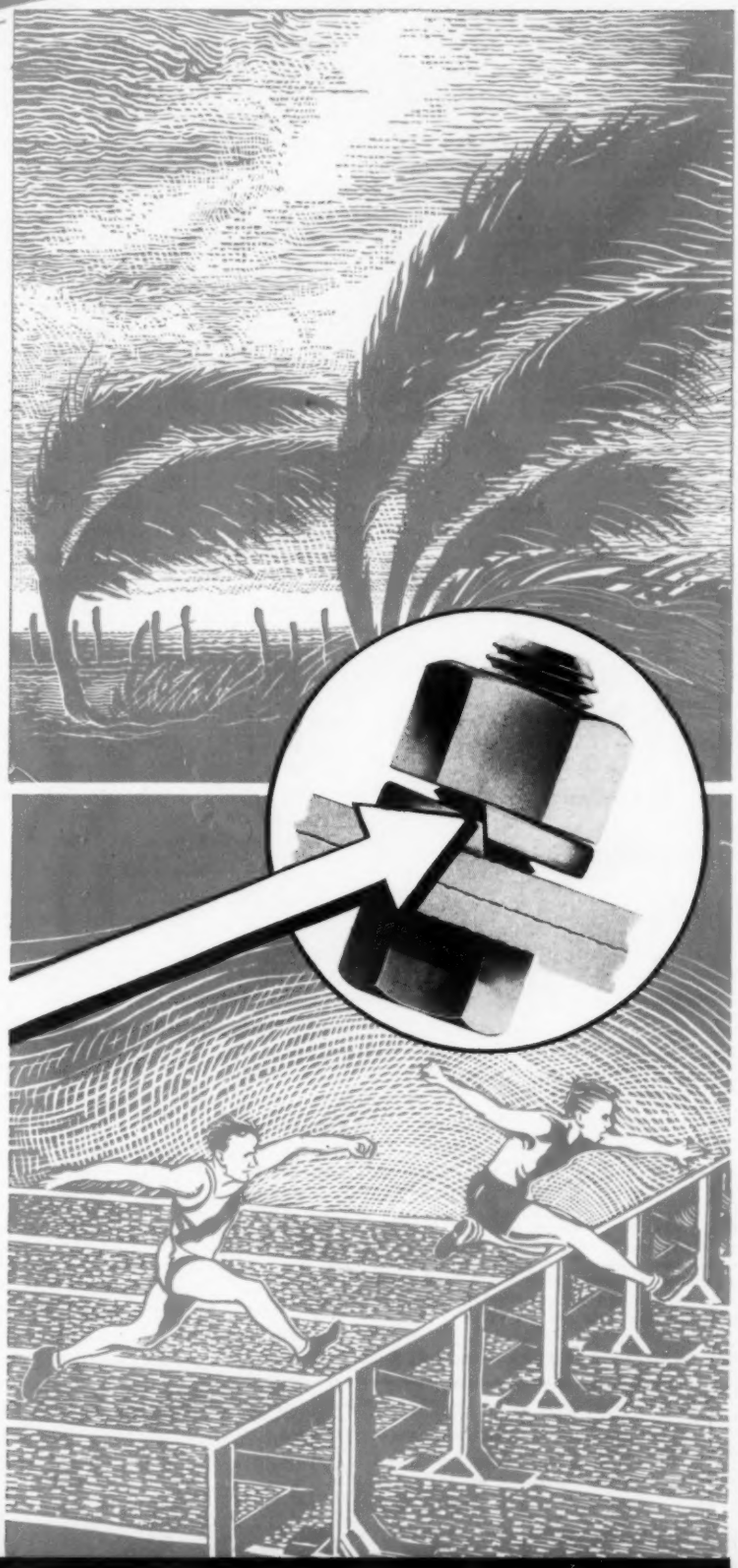

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German Developments Reported by British Intelligence

According to a report by the British Intelligence Objectives Sub-Committee, Friedrich Deckel of Munich developed during the war a Type D.F.K. 1 profiling machine of the copying type operating in three planes, and particularly suited for work in the die-sinking category. In fact, the British thought enough of the machine to ship it to England for further study. Here are the details as given in Final Report No. 283, Item No. 31:

"The machine embodies two adjacent tables each mounted on an independent vertical slide, one for carrying the work and the other the master. The cutter spindle and the copy tracer are mounted on a saddle which moves on a vertical slide and incorporates a pantograph or link motion for copying, the ratio being 1:1. The vertical slide is counterbalanced by spring tension which is adjustable to obtain a sensitive feel of the tracer relative to the conditions of cutting and type of cutter being used.

"Roughing is initially carried out with the vertical slide, saddle and pantograph in a locked position and by operating the handwheels controlling the compound slides. An optical attachment is used for roughing by which it is claimed an accuracy of plus or minus 0.004 in. can be maintained. The principle of this attachment is the reflection of the central point of the tracer spindle (on the opposite end to the tracer) on to a glass screen. When roughing the tracer spindle is permitted to float slightly and by keeping the reflected image within an inscribed circle on the screen a constant accuracy of reproduction is obtained.

"An infinitely variable range of cutter spindle speeds is provided by a two-speed motor driving through adjustable pulleys. The adjustable pulleys are mounted on a sliding block carrying a spindle. The pulleys are conical, the two outer halves being fixed with a sliding sleeve in between. Thus, two pullevs are formed, both of which adjust themselves to the driving belts as the sliding block is moved. The speeds are indicated in a sight window and the following range is obtainable: 300 to 1000 rpm.; 600 to 2000 rpm.; 600 to 4750 rpm.; 1200 to 9500 rpm."

In the same report, it is stated that the Ultra-Prazisionswerk G.M.B.H. has developed its P.F.S. 3 optical form grinder to handle both flat and circular work. The report says:

"Flat work is mounted on a compound slide at the right of the machine and its image together with that of the grinding wheel face is projected at a magnification of either 40 to 1 or 17 to 1 as required on to a glass screen on the left. Two large handwheels control the movements in both longitudinal and cross directions of the slide carrying the grinding head. These are operated so that the grinding wheel face follows a traced contour of the profile being ground and which is fastened to the screen. These diagrams or contours are accurately drawn at scales of either 40 or 17 to 1 on a special transparent paper, and it is claimed that independent of inaccuracies of the diagram, a gage with a precision of plus or minus 0.0001 in. is obtained.

"When grinding flat tools the grinding head is oscillated, but for circular work this mechanism is disconnected and a fixture is mounted on the compound work slide. This fixture has a motor attachment for driving circular work between centers.

"The optical system embodied in the machine is by Leitz.

"Details of the machine are: Size of projection, 440 x 280 mm.; maximum thickness of flat work that can be ground, 32 mm.; circular work can be ground up to 100 mm. diameter. Provision is also made for grinding angular reliefs on form tools."

At Adam Opel, the investigators found an unusual feature in the crushing rolls used for wheel forming in connection with thread grinders. The rolls were provided with series of spiral flutes unequally spaced around the periphery. Purposes of the flutes are: (1) to avoid distortion of the grinding wheel profile being crushed, (2) enable the abrasive to clear itself, and (3) increase life of the rolls. Rolls were made of steel with this analysis: 1.32% carbon, 0.35% manganese, 0.33% silicon, 1.4% chromium, and 0.17% vanadium. The heat-treatment was: heat to 820-850 C., quench in oil, temper at 220-260 C. in oil.

For thread rolls used on thread rolling machines, the firm of Ernst Grob recommended this steel: 1.8% carbon, 12.3% chromium, 0.20% vanadium, 9.34% manganese, and 0.39% silicon. The recommended heat-treatment is: heat to 700 C., raise to 970 C., retain at that temperaure for 5 to 7 min. Quench in oil at 60 to 70 C. Remove from oil and cool in air. Rockwell hardness of 63 to 64 C scale should result. Temper in oil at 180 C. for 2 hr., and this should give a final hardness of 62 to 63 C. scale.

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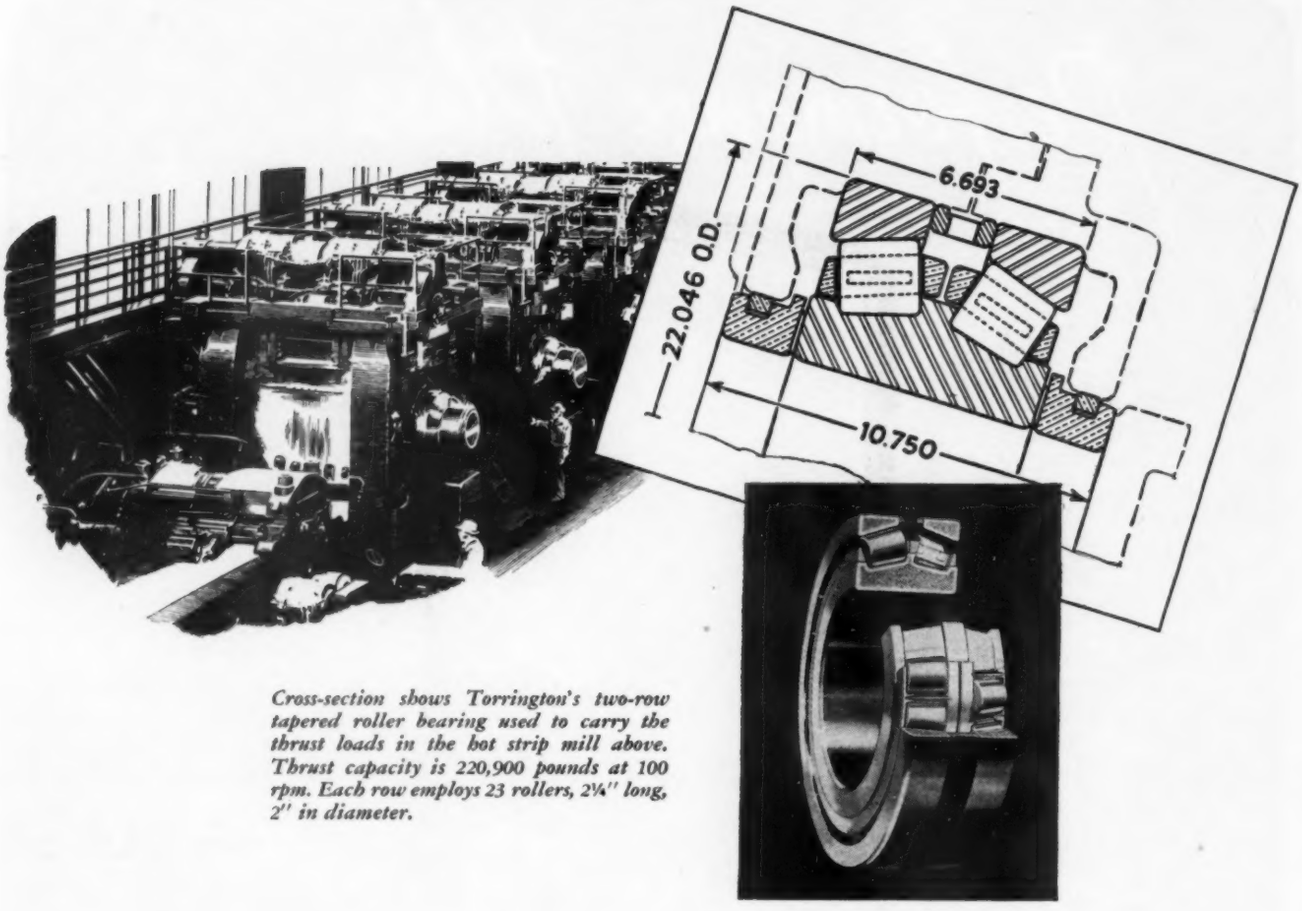
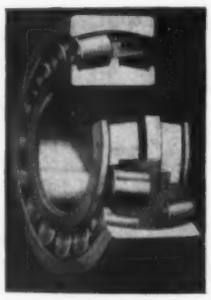


Cross-section shows Torrington's two-row tapered roller bearing used to carry the thrust loads in the hot strip mill above. Thrust capacity is 220,900 pounds at 100 rpm. Each row employs 23 rollers, 2¼" long, 2" in diameter.

BEST FOR BACK-UP ROLLS

Chrome Nickel Steel Roll Neck Bearings Help Set Peak Tonnage Records

THE TORRINGTON SELF-ALIGNING SPHERICAL ROLLER BEARING



features self-alignment, two-directional thrust and unit construction for easy installation and handling. It will be manufactured in a complete range of sizes from 1.5748" bore and up. See your nearest Torrington Representative or write for Bulletin 200.

Torrington's two-row tapered roller bearings made of S.A.E.-3310 steel (with higher nickel content), carry the thrust loads imposed on the back-up rolls of this 80" four-high continuous hot strip mill.

Bearing features include simplicity of design, which permits ready removal from roll necks; correct positioning in housing; clearance adjustment to permit assembly as received and take up as required with spacer control.

Supplying steel, oil, paper, machine tool and other industries with custom-made bearings for heavy-duty operations is an important function of Torrington's Bantam Bearings Division. Consult Torrington's engineering staff when you have unusual or standard friction problems.

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"3 times faster to find and drive"
PITNEY-BOWES tells independent investigator:
"That's just the time-saving we can measure," explained Pitney-Bowes' production manager to the James O. Peck Co. investigator, who is studying assembly savings with Phillips Screws in well-known plants. "Since using Phillips Screws on our postage meters, we have found that the time savings we can't measure exactly are even larger.

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GET PITNEY-BOWES REPORT AND OTHERS. Available to you now are nine independently made studies of assembly practice in famous plants, making metal, wood, and plastic products. A mine of ideas for cutting costs and ending trouble. FREE, of course. Use the coupon TODAY.

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26 SOURCES

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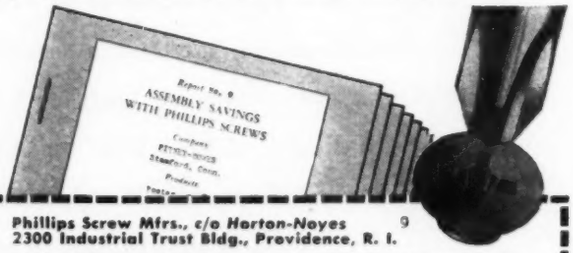

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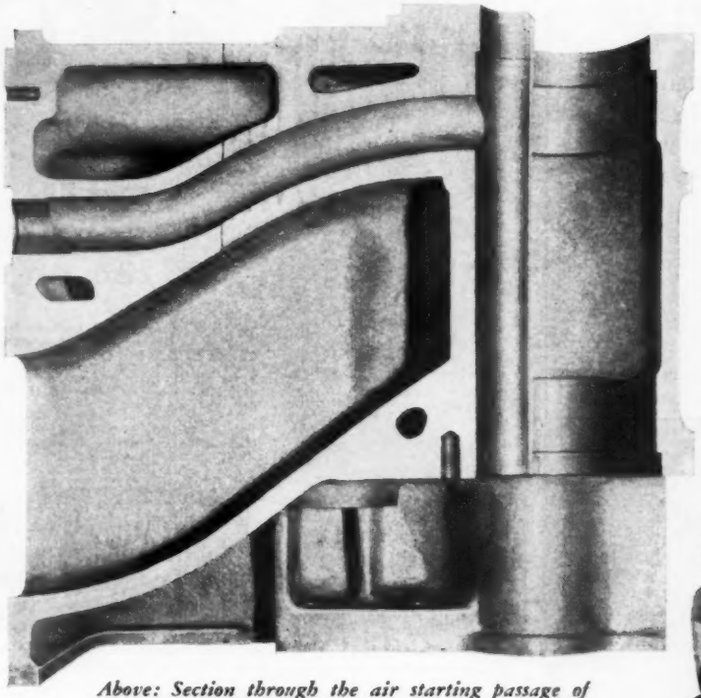
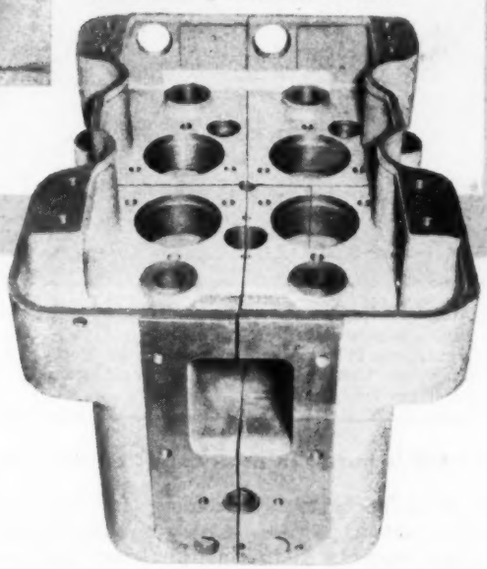
IN COMPLEX CASTINGS MEEHANITE ASSURES



Above: Section through the air starting passage of large 4-valve Diesel Head made of Meehanite Metal

Density and Solidity

Below: Large 4-valve Diesel Head made of Meehanite Metal



Engineering characteristics of a casting are determined by achieving uniform metal structure throughout all sections. Shrinkage problems common to molten metal during solidification are influenced by the degree of variations in sectional dimensions. Changes in section thicknesses such as those in the Diesel head casting illustrated result in a lack of uniformity, shrink zones, porosity, hardness variations and machining difficulties.

Meehanite manufacturing methods have been devised to overcome these ill effects with the result that complex designs such as the one shown may be produced with not only dependable physical properties, but uniform density and solidity, assuring pressure tightness and dimensional accuracy.

The casting pictured contains sections ranging from ¼" in the frame, head passages and cylinder walls, to 2" on the firing face of the cylinder head. All passage ways had to be water-tight and close tolerances maintained. Hundreds of these castings are being produced regularly and successfully in Meehanite.

Write for Bulletin No. 22 entitled "Stories of Meehanite in Industry."

New 16 mm motion picture "Meehanite Means Better Castings" just released. We will be glad to lend you a print.

MEEHANITE

PERSHING SQUARE BUILDING, NEW ROCHELLE, N. Y.

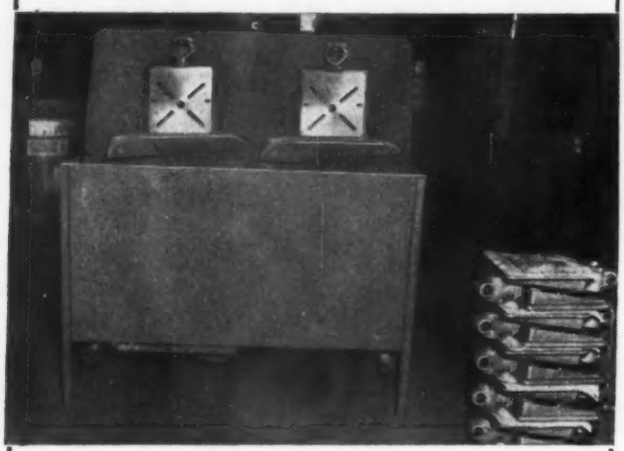
Detroit Manufacturer Saves $7000 a month with

TECTYL

RUST PREVENTIVE

Rust damage was costing this prominent manufacturer* of drill press table tops $7000 per month. Damaged units had to be reground; some were too badly marred to be salvaged. Since using Tectyl 511 to rustproof these parts, this loss has been eliminated. Table tops for drill presses are now safely stored up to six months after simple two-step protection.

**Name of this manufacturer will be given on request.*



After grinding parts on Blanchard Grinder they are first immersed in hot water bath (160° - 180°). Next, parts are given a cold dip in Tectyl 511. They are then ready for storage—safe against rust until needed.

Tectyl is made in many specialized types

There is a Tectyl solution for every rust problem. Tectyl — not a paint — leaves a thin, transparent film that protects metals against rust and corrosion for as long as two years. Tectyl is effective indoors or outdoors — in fresh and salt atmospheres.

Tectyl can be sprayed, brushed or flushed on, or parts can be dipped. Tectyl need not be removed for inspection of surface. Tectyl can be removed easily at any time with kerosene, petroleum solvent or alkali wash. For detailed information, write, stating type of rust problems encountered in your plant.

VALVOLINE **TECTYL** *ENDS RUST*

FREEDOM-VALVOLINE OIL COMPANY

DEPT. 38H, FREEDOM, PENNSYLVANIA

Cincinnati - New York - Boston - Washington - Toronto - Pittsburgh
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where you want it
when you want it

...if you specify

RUTHMAN GUSHER
COOLANT PUMP

Split second control of coolants from a trickle to full volume is just one of the many advantages of Gusher Coolant Pumps.

There is no priming, no packing, no leakage of coolants. When the Gusher is throttled you use less power.

For a coolant pump that will save both time and money, specify Ruthman Gusher Coolant Pumps on your machines.

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IF—

you have an operation that requires

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or
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An Oakland Air Cylinder will do it faster and easier.

Write for attractive catalog.

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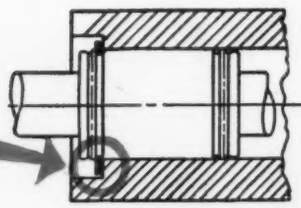
OAKLAND ENGINEERING CO.
800 100th AVENUE
OAKLAND 3, CALIF.

New Ball Bushing is prefabricated for fastening with Waldes Truarc Retaining Rings

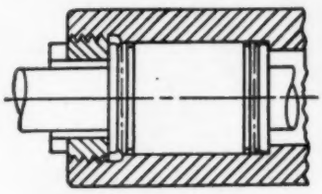
WHICH OF THESE FOUR WAYS WOULD YOU USE TO HOLD BALL BUSHINGS?

Having launched a revolutionary new product, Thomson Industries, Inc., Long Island City, promotes customer satisfaction by also determining the most efficient method of installing the Ball Bushing. With all possible methods of fastening at its disposal, Thomson Industries recommends Waldes Truarc Rings—and proves its conviction by pre-grooving the Bushing. Why? The reasons are obvious on this page.



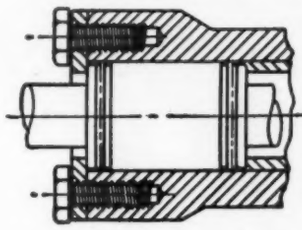
1

Compare the compact simplicity of this Truarc application with the designs below, any of which are standard good practice. *See how Truarc cuts costs of material, machining and assembly.*



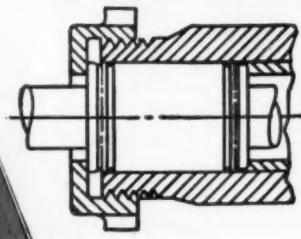
2

You could use a collar like this, with its extra material, tapping, threading and additional assembly time.



3

You could fasten it with bolts—look at the extra material and machining in the housing; see how it complicates assembly.



4

You could retain it with a heavy external collar—extra material and labor, more time on the assembly line.

Whether your product is still on the board or has been in use for years, there's a Waldes Truarc Retaining Ring that will make it simpler, more economical to make and repair. Truarc Rings conform to NAS standards, give a never-failing grip. Truarc's constant circularity is assured by its patented tapered design. Truarc engineers can guide you, help you, make suggestions. We'll give your particular problem individual attention without obligation.

WALDES

TRUARC

TRADE MARK

RETAINING RINGS

Waldes Kohinoor, Inc., Long Island City 1, N. Y., Dept. 12E
Please send Free Booklet on Truarc Retaining Rings to

Name & Title_____

Firm_____

Address_____

City_____ Zone____ State_____

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

VISIT TRUARC BOOTH ● Instrumentation-for-Tomorrow Exhibit ● HOTEL WILLIAM PENN, PITTSBURGH ● SEPT. 16-20

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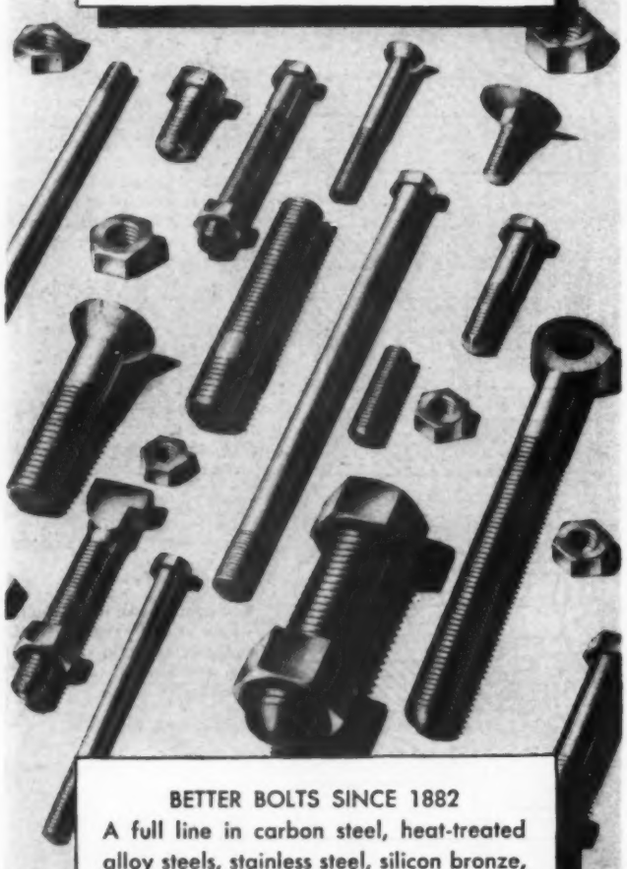
BOLTS · NUTS STUDS

Every standard alloy steel—fabricated into bolts, nuts, studs and many special fastenings. Accurately made in standard dimensions or to meet your specifications.



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A full line in carbon steel, heat-treated alloy steels, stainless steel, silicon bronze, brass, bronze, and monel metal.

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DON'T GO OFF ON A TANGENT

Specify

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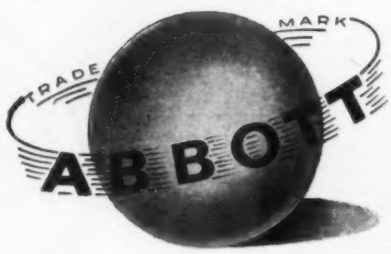
and be sure!



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DO YOU KNOW THIS

WATER SOLUBLE CUTTING COOLANT

IN PASTE FORM

Fiske "MAGIC" Compound, when dissolved in water, cools, lubricates, produces a high finish and lengthens tool life. There is nothing else like it for milling, drilling, grinding, turning, sawing, threading and similar operations. It is rust resistant, stays mixed and will not become rancid. Try it and see the improvement in your work. Fiske "MAGIC" Compound is sold on a "results" basis. Write today for information and literature.

FISKE

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LUBRICANTS

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Established 1870

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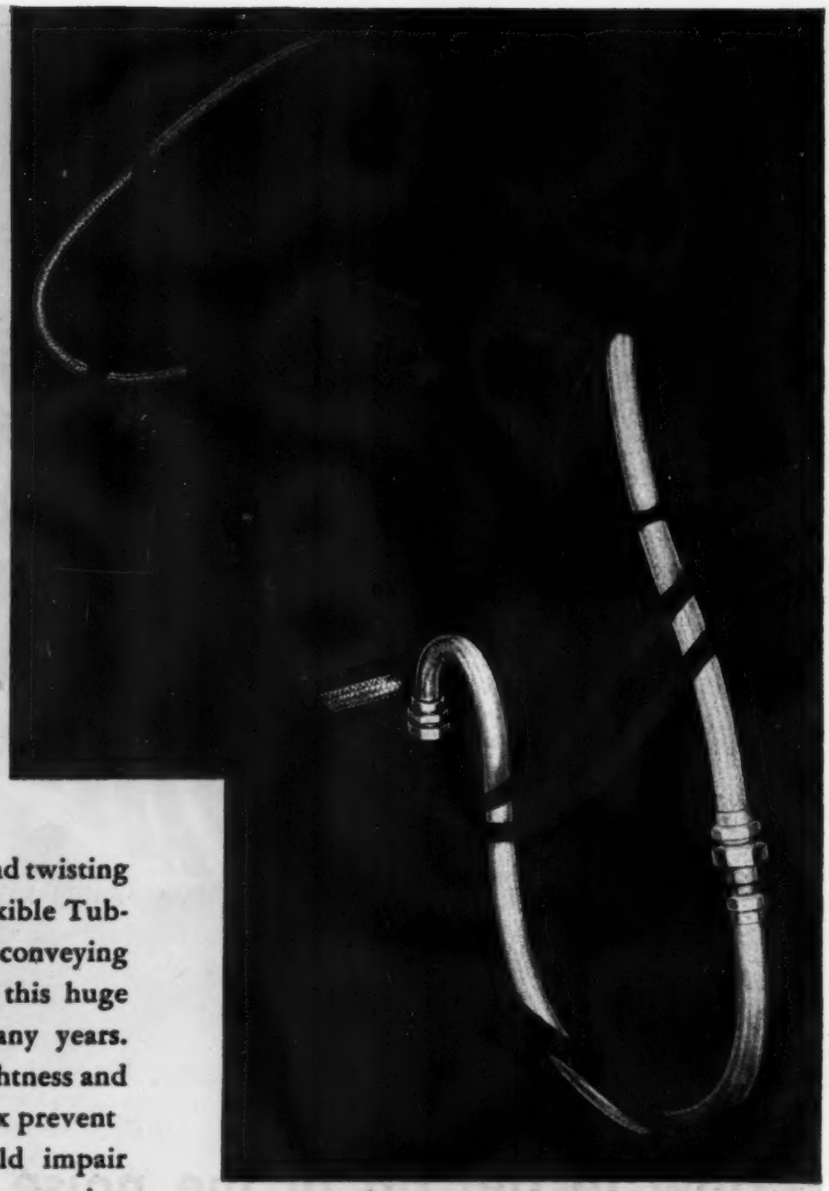
FLEXIBILITY

TO WITHSTAND 120 STROKES PER MINUTE



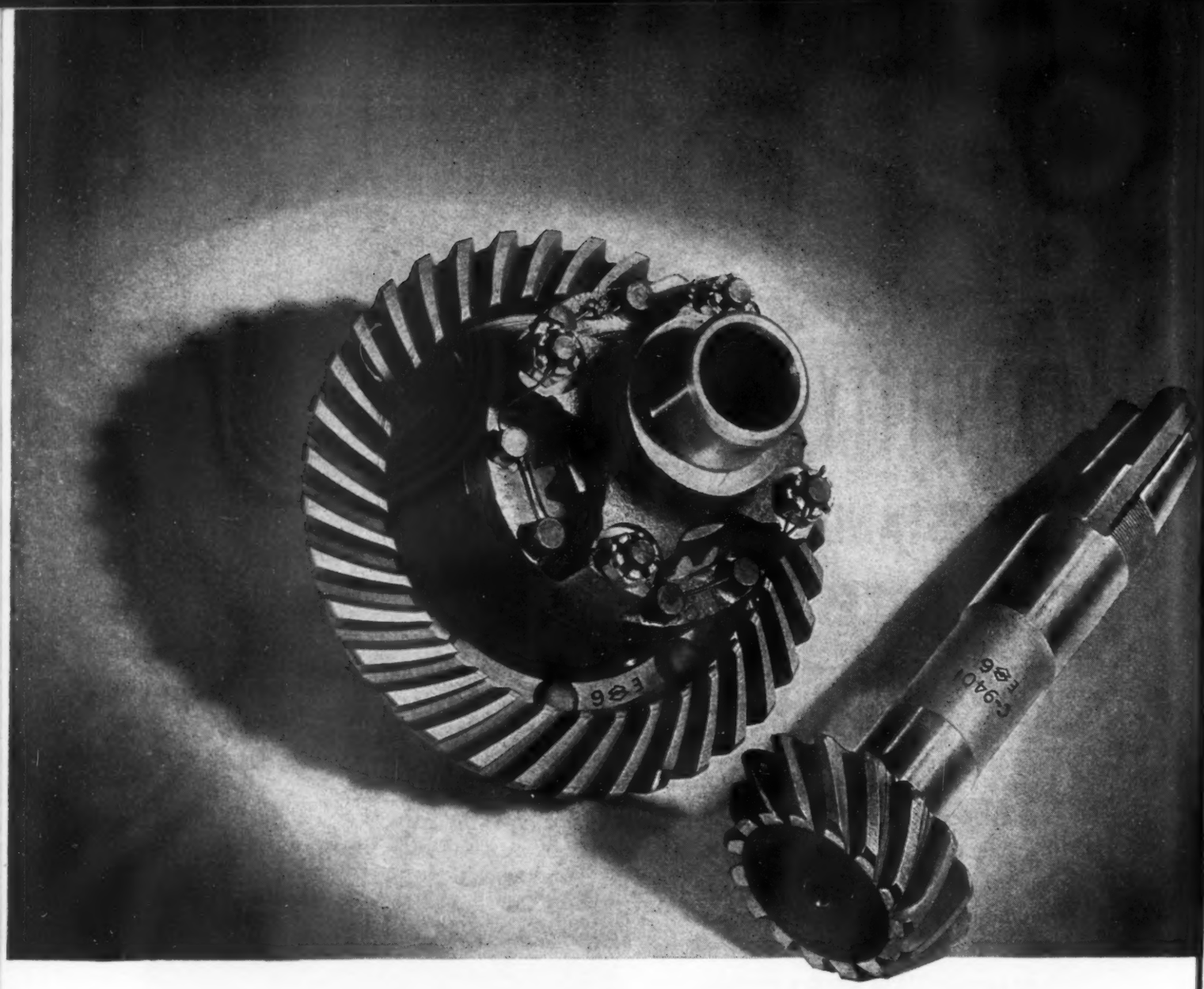
Despite constant flexing and twisting this Titeflex all-metal Flexible Tubing has been faithfully conveying coolant to the wheel on this huge grinding machine for many years. The inherent pressure-tightness and long service-life of Titeflex prevent line leakage which would impair operating efficiency—interrupt important production schedules.

Similarly, Titeflex provides identical trouble-free protection and service while operating under critical heat, cold, pressure, and corrosive attack.

The same economies and increased service performance can benefit your product and plant production. We will be glad to give you the facts on all types of Titeflex installations. Catalogue No. 113 is available on request. Titeflex, Inc., 535 Frelinghuysen Ave., Newark, New Jersey.

Titeflex

THE ALL-METAL FLEXIBLE TUBING
THAT STAYS TIGHT



How to get rid of the noise you can't hear*

IN SPITE OF TESTING—ordinary gears that are quiet at the time of installation may develop noise and become costly maintenance problems. This is the reason scores of manufacturers have found it wise to invest in Double Diamond extra quality.

Special hardening processes, skillful machining and more rigid inspections assure this extra precision. It will pay you to take advantage of Double Diamond Engineering Service. Whether you have a gear design or application problem, experienced Double Diamond designing consultants will assist you in obtaining longer trouble-free service from gears.

AUTOMOTIVE GEAR WORKS, INC., RICHMOND, INDIANA

DOUBLE DIAMOND
TRADE MARK
GEARS

*the gears with the "JEWEL MOVEMENT"**

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

Westinghouse Turbo-Jet Engine

High Speed with Minimum Weight and Space

these are secrets of

JET PROPULSION

As swift as sound—the new miracle planes owe their tremendous speed to the jet propulsion engines that power them.

High speed—light weight—extreme compactness—these are three basic requirements of today's jet propulsion engine design.

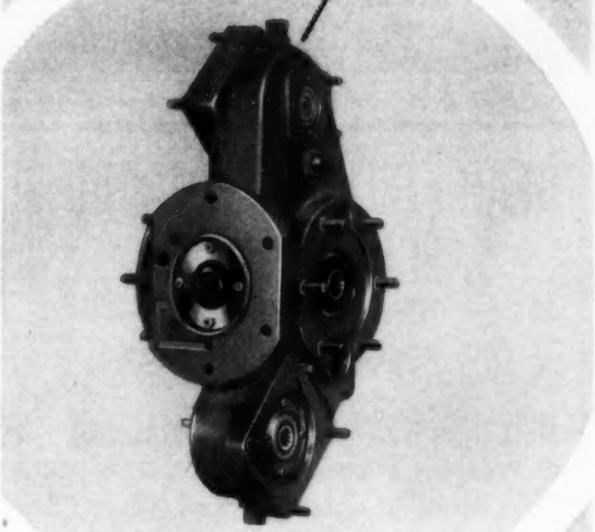
Working closely with manufacturers of these new engines, Foote Bros. have produced accessory drives which are geared to the shaft of the turbine and which provide the power necessary to operate pumps, starter motors, generators and other equipment.

This specialized application suggests one use of Foote Bros. Power Units. On any type of machine or equipment they permit exact timing of operations from remote control. Position may be predetermined and held to close limits. These Power Units may be used to actuate linear or rotary motion.

Your engineer may find an idea for improving your product in the Power Unit Bulletin recently issued. Foote Bros. engineers will gladly work with them on the design of a unit to meet your specific need.

★ ★ ★

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. E, 4545 South Western Boulevard • Chicago 9, Ill.



A recently issued bulletin on Power Units giving complete engineering data on "packages of power" will be sent on request. Also available is a bulletin on Aircraft Quality Gears.

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. E, 4545 S. Western Boulevard, Chicago 9, Illinois
Please send me Bulletins on: ☐ Power Units
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Our 69-Year Experience

Grant "know-how" in making and supplying gears is at your service. Whether you require a single "special" or stock gears in quantity, it will be to your advantage to submit your requirements to "Grant" for quotation and delivery date. We are in position to render prompt service.

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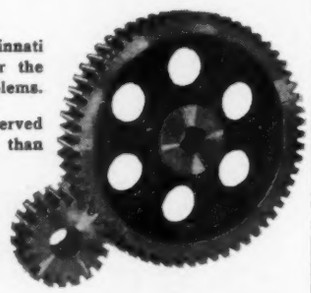
Cincinnati Gears
REALLY
"Get Around"

★ SPUR
★ BEVEL
★ HELICAL
★ SPLINE
★ WORM
★ SPECIAL



Leaders in industry look to Cincinnati *Gears, Good Gears Only*, for the profitable answer to their gear problems.

Cincinnati Gears have faithfully served industrial requirements for more than forty years in providing the right gears for the job.

If it's precision, accuracy and continuous performance you want in gears . . . look to Cincinnati *Gears; Good Gears Only.*

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"Gears . . . Good Gears Only"
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New Design
New Features
New Advantages

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• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MP **MEISEL PRESS MFG. CO.** MP
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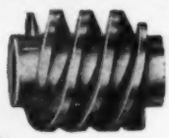
"HARTFORD" for Gears, Cams, Thread-Grinding



OUR SERVICE INCLUDES:

. . . cutting gears of every description exactly to specifications
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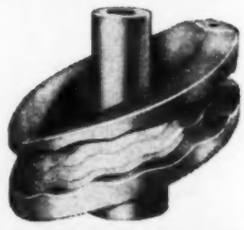
You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



THE HARTFORD SPECIAL MACHINERY CO.
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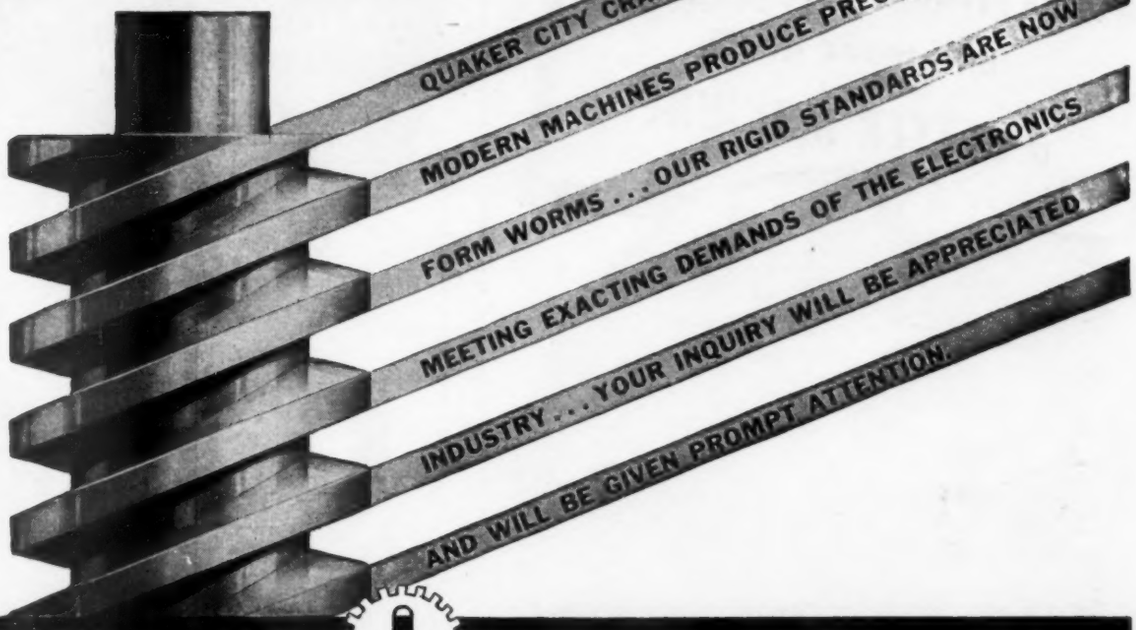
THE ART OF ACCURACY


QUAKER CITY CRAFTSMEN, USING THE MOST
MODERN MACHINES PRODUCE PRECISION GROUND
FORM WORMS . . . OUR RIGID STANDARDS ARE NOW
MEETING EXACTING DEMANDS OF THE ELECTRONICS
INDUSTRY . . . YOUR INQUIRY WILL BE APPRECIATED
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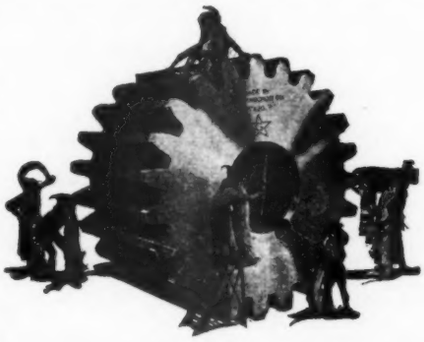
QUAKER CITY GEAR WORKS, INC.



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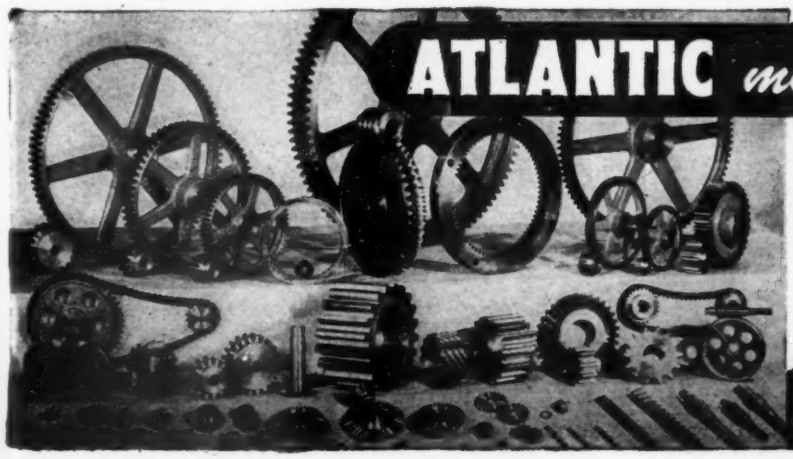
Better Gear Products

GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.



ATLANTIC *makes fine* GEARS

ANY TYPE — Spur, helical, herringbone, bevel, worm, spiral
ANY SIZE—¼" to 60"
ANY MATERIAL—Cast iron, steel, brass, bronze, Micarta
ANY QUANTITY—One gear or volume production

We are equipped for prompt service on SPECIAL GEARS AND BREAKDOWN JOBS. Send us blueprints or gear samples for our quotations and delivery dates.

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Worms produced by this method will make yours a BETTER MACHINE

In order that worms might match the accuracy of Sier-Bath Gears—noted for their extremely close tolerances—we installed the Jones & Lamson Thread Grinder shown here. This versatile, highly accurate machine maintains precise thread form automatically. It practically eliminates the human element.

This unusual application of an unusual machine is typical of the many advanced techniques at Sier-Bath Gear Company. These include, for example: gear shaving to eliminate cold working and consequent distortion—controlled quenching, automatic heat treating, flame hardening—mechanical checking in an air-conditioned checking room. Thus, Sier-Bath offers to every manufacturer the precision that was formerly found in only the largest airplane engine companies.

GEAR RANGE

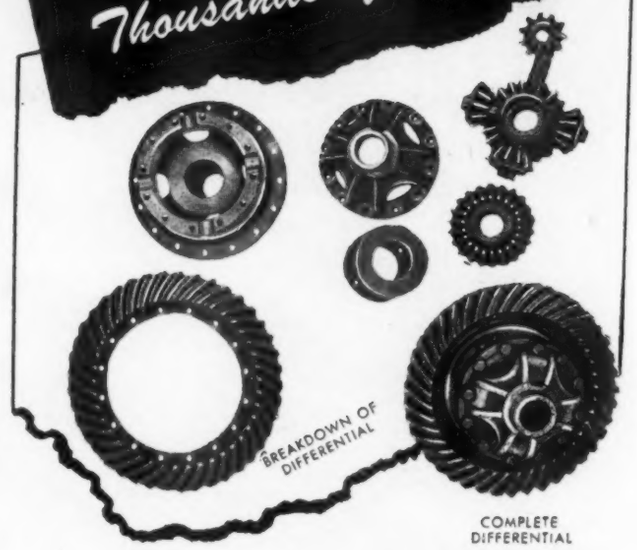
● Spur, helical and worm gears to 48"; worms to 12"; straight tooth bevel gears 32 pitch to 3 pitch. Gears shaved from 1" to 24" inclusive. Continuous Herringbone gears generated by Sykes Method up to 37" O. D.

SIER-BATH GEAR COMPANY, Inc.
9246 Hudson Boulevard, North Bergen, N. J.

Founded 1905 — Member A. G. M. A.

Sier-Bath Gear Co.

Fairfield Makes Thousands of These!



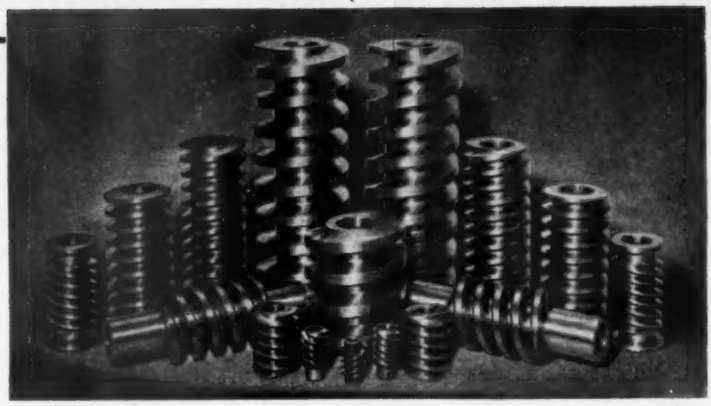
FAIRFIELD'S production of many thousands of differentials for heavy duty trucks is just one example of the facilities available to you for production of gears, differentials, splined shafts and allied items.

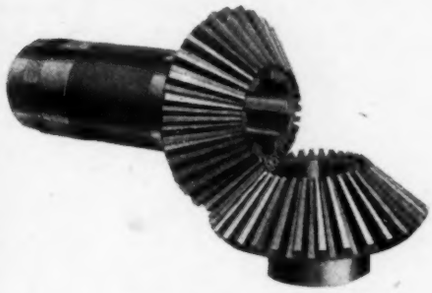
Every job that comes to Fairfield is done on the very best machines for fast production and is done by highly skilled craftsmen who give the task expert attention. Well-equipped gear cutting departments work closely with the grinding department, the automatic turning department, and the heat treating department, making production fast, smooth and sure.

Next time you need gears, remember Fairfield. Write for illustrated brochure.

FAIRFIELD MANUFACTURING CO.
307 S. Earl Avenue • Lafayette, Ind.

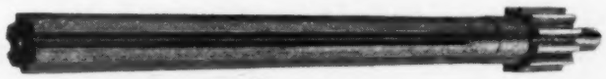
FAIRFIELD for FINE GEARS



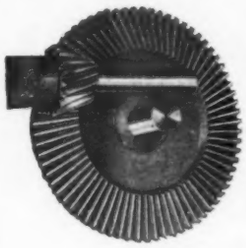


Specialists in the production of all types of GEARS

● ADAMS Gears are produced with the finest production and inspection equipment obtainable. Full cooperation and adherence to your specifications. Our engineering service is available for consultation.



The ADAMS Company
DUBUQUE, IOWA
ESTABLISHED 1883



BILGRAM QUALITY GEARS

BILGRAM TRADE MARK

ALL TYPES • ALL MATERIALS
BILGRAM GEAR & MACHINE WORKS
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GEARS TO ORDER

Spiral and helical gears; special couplings, bushings and collars; pins, pulleys and rollers. Made to your specifications—*promptly.*

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Bristol, Tennessee

PRECISION *Gears* TO YOUR ORDER

★ BEVEL—¼" to 18" O.D.
★ SPUR—¼" to 36" O.D.
★ INTERNAL—to 36" O.D.
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Exactly to Your Specifications

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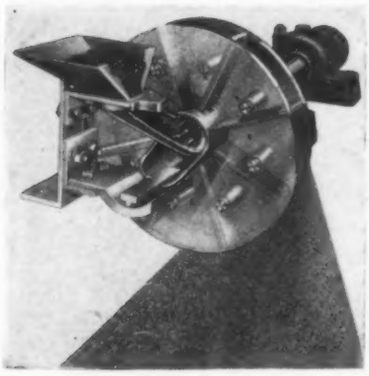


Simplifies Production...

Lake Erie Hydraulic Press eliminates heating, welding and many other steps in the manufacture of the Wheelabrator Airless Blast Unit shown at left.

A PRACTICAL example of the way modern hydraulic presses streamline production is provided by the American Foundry Equipment Co. of Mishawaka, Indiana. Here, in the words of that company, are the production economies that resulted when they installed the 1000-Ton Lake Erie Hydraulic Press illustrated.

★ ★ ★

"The two circular side plates used on our Airless Wheelabrator Blast Unit are now straightened cold in the Lake Erie press... they formerly had to be heated before straightening.

The spacers used to separate the side plates are now riveted in place in the Lake Erie press... this operation used to be handled by hole welding.

We are now braking circular deflectors and liners... these parts used to be rolled in a bending roll.

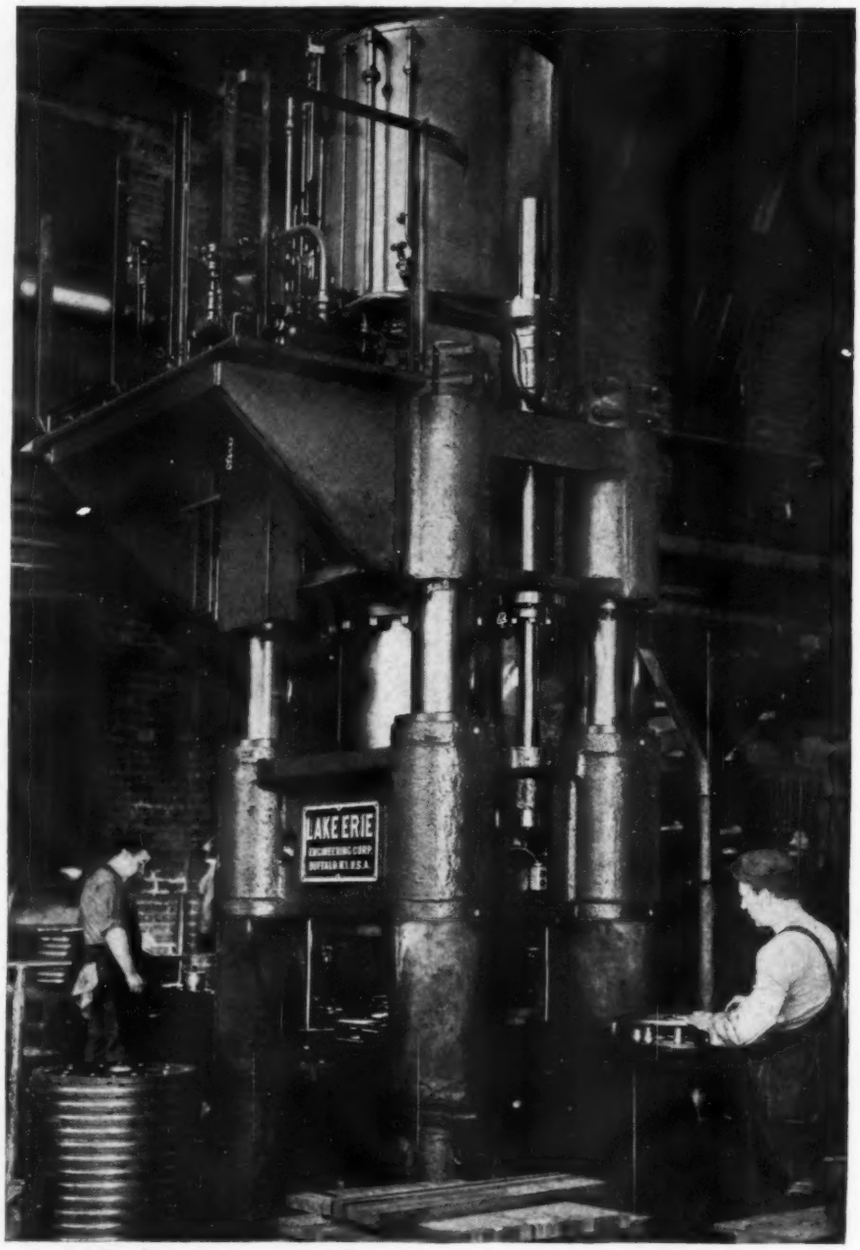
The flights on the endless conveyor which forms the cleaning chamber of our 27″x36″ Wheelabrator Tumblast are now formed completely in the Lake Erie press... to get the shape desired on this flight we used to weld a 1-inch half-round bar the full length of the flight.

We are now straightening numerous castings cold in the Lake Erie press that formerly had to be heated and straightened in our blacksmith shop.

Reinforcement bars for the endless belt conveyor used on our 48″x42″ and 48″x72″ Wheelabrator Tumblasts are being made in the Lake Erie press... it formerly took three operations to do this on an ordinary press brake."

★ ★ ★

Lake Erie Engineers, through their day-to-day contacts with leading manufacturers, have valuable information about methods for improving product quality and plant efficiency with hydraulic presses. This practical experience is available to you for the asking. Consult Lake Erie's Engineers today or write for latest Bulletins on hydraulic presses. No obligation, of course.



LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE
ENGINEERING CORPORATION
507 Woodward Avenue, Buffalo 17, N. Y.

Offices in Principal Cities and Foreign Countries

Leading manufacturer of hydraulic presses —all sizes and types—metal working... plastic molding... processing... rubber vulcanizing... stereotyping... special purpose.

SPEED CASE

LOW CARBON OPEN HEARTH STEEL

WINS AGAIN

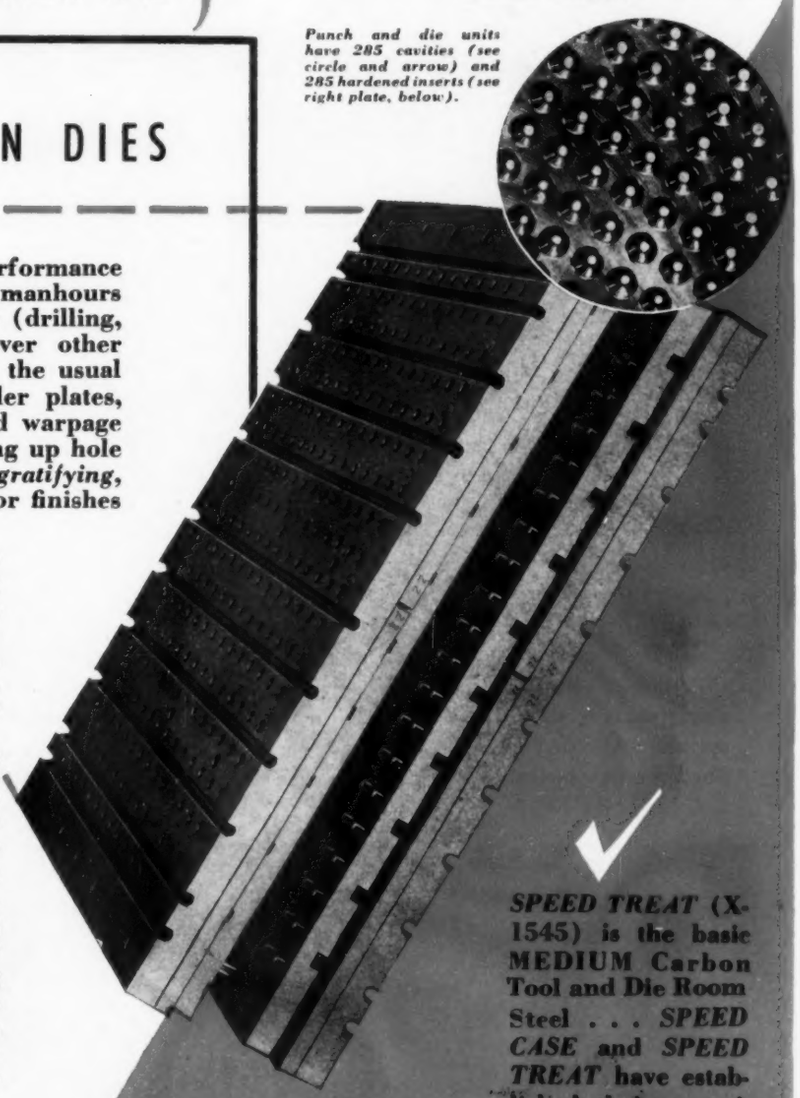
KOPPY-DEKORSE TOOL & DIE CO. Detroit
Precision Tools & Dies

"We naturally made these plates out of *SPEED CASE* and had absolutely no trouble whatsoever."—
Louis Koppy, President

APPLICATION

PLASTIC BUTTON DIES

Punch and die units have 285 cavities (see circle and arrow) and 285 hardened inserts (see right plate, below).



SPEED CASE **(X 1520) performance netted a marked reduction in manhours and three times longer tool life (drilling, milling and cavity cutting) over other open hearth steels. Contrary to the usual behavior of mild steel, or boiler plates, these Speed Case plates resisted warpage in carburizing, *all six units* lining up hole for hole when assembled. *Most gratifying*, operators readily obtained mirror finishes on intricate cavities.**

We quote: "These plates were completely machined, including roughing out all holes. Plates were then normalized and we finish-machined from one end to the other. We had excellent success on them, maintaining accuracy, precision and location of holes."

"This plastic button die, of which we built six complete units with universal assembly, was constructed with soft main plates using hardened inserts as punch and die units with carburized and hardened backing plates. We naturally made these plates out of *SPEED CASE* and had absolutely no trouble whatsoever. We are using quite a lot of *SPEED CASE*, we like its machining qualities. It holds up better than ordinary plate for most of the complicated pieces we usually have to work on."

SPEED TREAT **(X-1545) is the basic MEDIUM Carbon Tool and Die Room Steel . . . *SPEED CASE* and *SPEED TREAT* have established their superiority for machine parts, dies, molds, surface plates, etc.**

W. J. HOLLIDAY & CO.
"Established 1856"
Hammond and Indianapolis
Speed Case - Speed Treat Plate Division, Hammond, Indiana

Speed Case and *Speed Treat* Steel is available in all common plate sizes from these distributors:

Beals, McCarthy and Rogers, Inc., Buffalo 5, N. Y.
Brown-Wales Co., Boston 10, Mass.
The Burger Iron Company, Akron 1, Ohio
Grammer, Dempsey & Hudson, Inc., Newark 5, N. J.
Peninsular Steel Co., Detroit 7, Mich.
Earle M. Jorgensen Co., Houston 1, Tex.
Los Angeles 54, Calif.
Oakland 7, Calif.
Horace T. Potts Co., Philadelphia 34, Pa.
Peckover's, Ltd., Toronto 2, Ont., Canada

Doing Any Blanking?

MULTIPRESS

has the advantage of CONTROLLED RAM SPEEDS AND PRESSURES

● For the first time in a hydraulic unit, MULTIPRESS brings the kind of ram action you need for efficient, low-pressure, high-speed blanking operations—and adds some typical MULTIPRESS operating advantages in the bargain.

MULTIPRESS, for example, enables you to pre-regulate pressure loads to the exact needs of each operation. Equally important, you can design for progressive operations without having to consider torque losses. You pierce or blank at the same pressure level throughout all stages of step-punch operations—at pressures that do the job perfectly without risk of tool breakage if the metal jams or doubles in the die. And on single-cycle blanking operations MULTIPRESS ends all danger of double strokes.

Users report that this close regulation of pressures gives timely warning when tools are getting too dull for good operation. Also that quick, easy adjustment of ram stroke *length* speeds up job change-overs and gives MULTIPRESS added utility value.

On some operations, it has been indicated that the steady, uniform ram action of the MULTIPRESS gets better, cleaner results. The advantages of this *controlled ram action* shows up even more clearly on secondary drawing and forming operations.

In MULTIPRESS, you have a choice of 4-, 6- and 8-ton capacities, each in seven models, with manual or automatic-cycling controls—plus standard MULTIPRESS toolings and accessories that adapt the basic unit to scores of special operations.

The remarkable operating features of this highly compact, self-contained tool are quickly evident in the 4-ton unit: Its ram stroke is fully adjustable from 1/16-inch to 6 inches . . . downward ram pressing range is from 300 to 8000 pounds at 200 ipm; ram return effort up to 5000 pounds . . . it weighs only 725 pounds and measures only 16 x 26 x 34 inches. Write for details on this mighty production midget!

ROLL-FEED BLANKING OPERATION

HIGH-SPEED LAMINATE BLANKING

DENISON EQUIPMENT for APPLIED HydrOILics

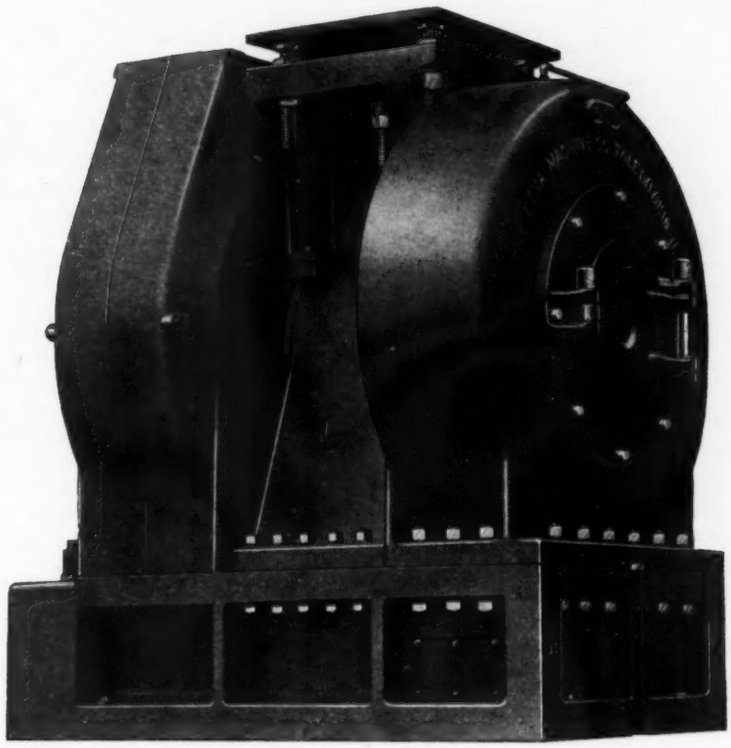
THE DENISON ENGINEERING CO.
1164 DUBLIN ROAD, COLUMBUS 16, OHIO

For Every Job of Swaging

there's an

ETNA

Rotary Swaging Machine



6000 HAMMER BLOWS OF INFINITE FORCE PER MINUTE

- The work is held stationary. The dies and hammers rotate around the work, swaging it to desired size and shape quickly and efficiently.
- Built to handle the severest work with capacities up to 14 inches in diameter.
- Integral forced coolant and lubrication systems.
- Handle hot or cold work.
- Readily equipped with a variety of feeding devices.
- Cast alloy steel drum mounted on base and bolted to front housing.
- Timken bearings take spindle thrust. Radial ball bearing in rear of flywheel.
- Alloy steel forged, heat-treated and ground spindle.
- A taper fit is used for the fly wheel which is further secured by a split nut and key.
- Hammers, rolls and inner ring of heat treated alloys.
- Motor is mounted over the machine on an adjustable bracket, the power being transmitted by V-belts.

Consult Etna about the possibilities of application of swaging machines to your production.

THE ETNA MACHINE CO., TOLEDO 10, OHIO

SAVE HANDS WITH STRANDS
Safguards
FOR PUNCH PRESSES

Write for descriptive bulletins to get the important facts

STRAND MANUFACTURING CO., INC.
SAFETY ENGINEERS
600-13 WEST LAKE ST. CHICAGO 6, ILL.

Available for IMMEDIATE DELIVERY
HUB POWER PRESS
for speed, accuracy and economy

These convenient, high speed, power presses will handle materials with ease and convenience. Assures high production of parts at lowest cost.

Made in 4½, 6 and 15 Ton Capacities.

Send for Circulars and Prices.

WILLIAM F. BREWER MACHINE CO.
75 LAUREL STREET HARTFORD 6, CONN.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

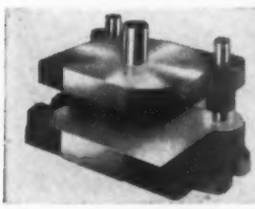
Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.



DANLY
PRECISION DIE SETS
STANDARD OR SPECIAL

Their Precision Means Greater Accuracy in Your Production

DANLY MACHINE SPECIALTIES, INC.
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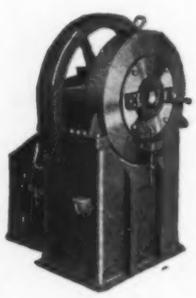
PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V&O Press Co.
HUDSON, N. Y.

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

GRANT

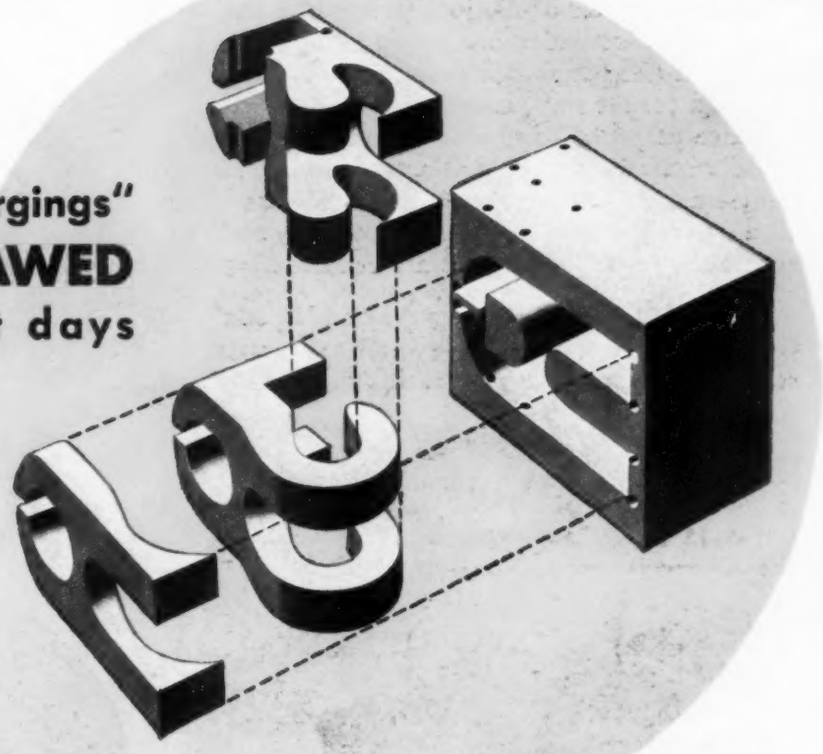
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

DoALL *Miracle* SHAPE CUTTING

for low-cost production



"castings" and "forgings"
CONTOUR SAWED
in minutes — not days

Finished part (center) was Contour Sawed—*the world's fastest metal-removing process*—the only process that really slashes time and cost on this and countless other jobs. Contour Sawing slices off pieces in bulk — does not waste time "whittling" metal to worthless chips. Hundreds of razor-sharp, super-hard teeth on a band cut a narrow kerf; cutting is continuous—no lost backstroke motion. All materials, even tough alloys and steels 30 in. thick, can be Contour Sawed.

Think of the cost of many production parts—then remember that they can be Contour Sawed at a small fraction of that cost! This is your shortcut around costly production problems. Write for free booklet *"DoALL Equals Ten Plus"*, which shows many amazing advantages of Contour Sawing.

The DoALL *Company*

DoALL STORES
IN PRINCIPAL CITIES

MACHINE-TOOL DIVISION
MINNEAPOLIS 4, MINN.

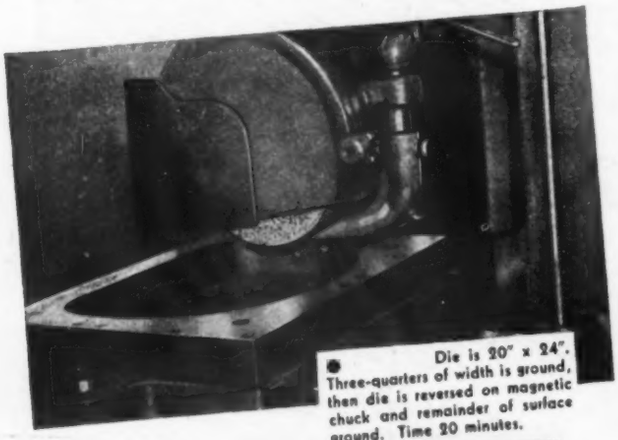
'TIME OUT' FOR DIE RECONDITIONING HELD TO A MINIMUM

with the Mattison Grinder

A GREAT variety of die work can be speedily and easily handled on the Mattison Surface Grinder. Its large capacity, ability to hog off stock and high power, keeps the 'time out' periods to a minimum.

A few examples of die jobs ground on the Mattison at a considerable saving in time, are shown on this page. Die shown in the lower left hand corner was ground with leader pins in place at 1/3 of former time. Wheel and spindle clearance of Mattison Grinder is sufficient to handle this type of work with ease, eliminating time required for disassembly and alignment when leader pins are removed.

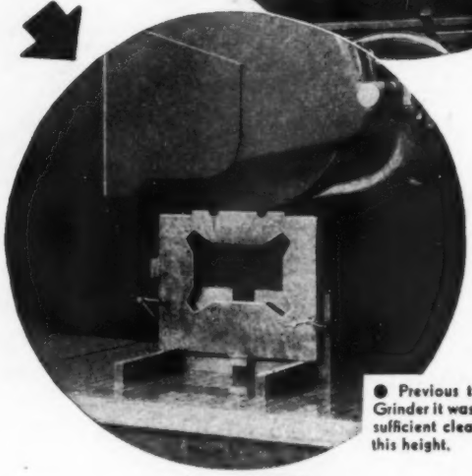
For further data regarding use of Mattison Grinders for reconditioning dies, ask us to send you free set-up book on this subject.



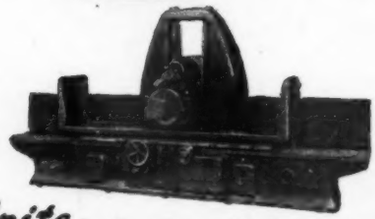
● Die is 20" x 24". Three-quarters of width is ground, then die is reversed on magnetic chuck and remainder of surface ground. Time 20 minutes.

● Time is saved by grinding dies with leader pins in place.

● Material: Hardtem Steel Forging die.
Stock Removed: 1/64" from face side.
Present Time: 8 minutes.
Previous Time: 30 minutes.



● Previous to obtaining Mattison Grinder it was not possible to obtain sufficient clearance to grind dies of this height.

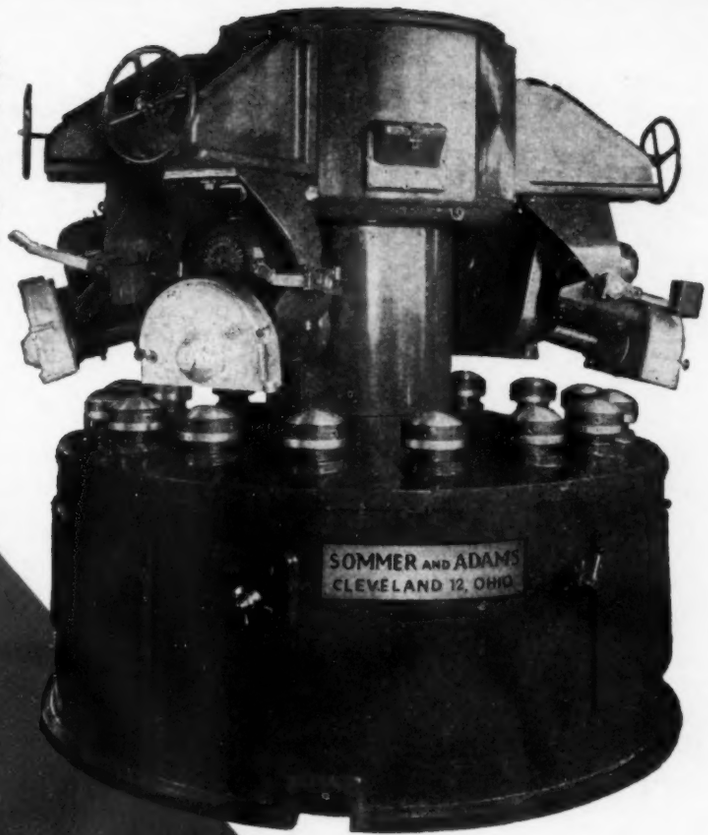


Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

If It Can Be Done
S&A Can Make Machines to Do It!

THIS S & A MACHINE
AUTOMATICALLY
POLISHES 800 to
1000 PIECES
HOURLY



Circular metal or plastic pieces are progressively polished as this eight station S & A machine indexes work under wheels graded from roughing grit to finishing rouge.

SOMMER and ADAMS

Special Purpose machine tool applications are as broad as the basic questions of Production Economics . . .

Can the operation be performed automatically?

Is the market potential adequate to absorb the vastly increased production such a machine will develop?

Wherever these are answered affirmatively you have special purpose requirements to which Sommer and Adams can give you the best answers. Often a production set-up which appears to be giving the utmost in efficiency is subject to profitable improvement when submitted to S and A engineering study.

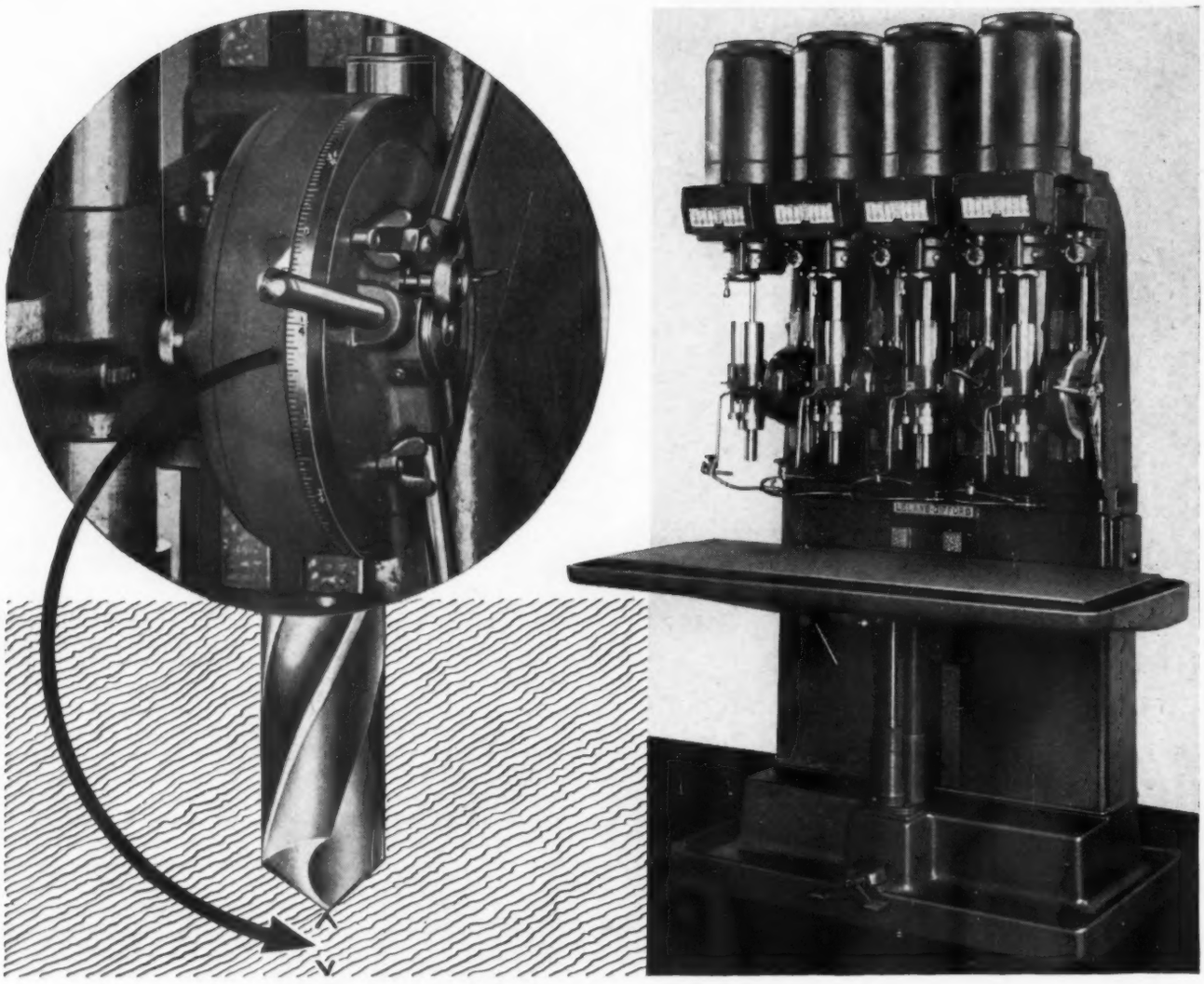
A quarter-century of experience qualifies this organization to accurately analyze the economics of your production . . . to report honestly whether Sommer and Adams special purpose design can help you.

We call this service Productioneering. We have a book on the subject describing our facilities, experience and organization. Copies are available to executives with bona fide special purpose problems.

Write, stating your need, to

THE SOMMER & ADAMS COMPANY
18501 EUCLID AVENUE, CLEVELAND 12, OHIO
Custom-Built EQUIPMENT FOR MANY PURPOSES

SUBSIDIARY OF THE FEDERAL MACHINE AND WELDER COMPANY



Depth Setting
is Quick, Easy and Accurate with the LELAND-GIFFORD

Power Feed. The graduated dial directly in front of the operator shows the distance remaining to the bottom of the hole while drilling.

Engaged by the natural movement of starting the drill.
Disengaged automatically at depth or at any time by reverse movement.
Hand Lock engagement for reaming.
Locking Pin converts to hand Feed.

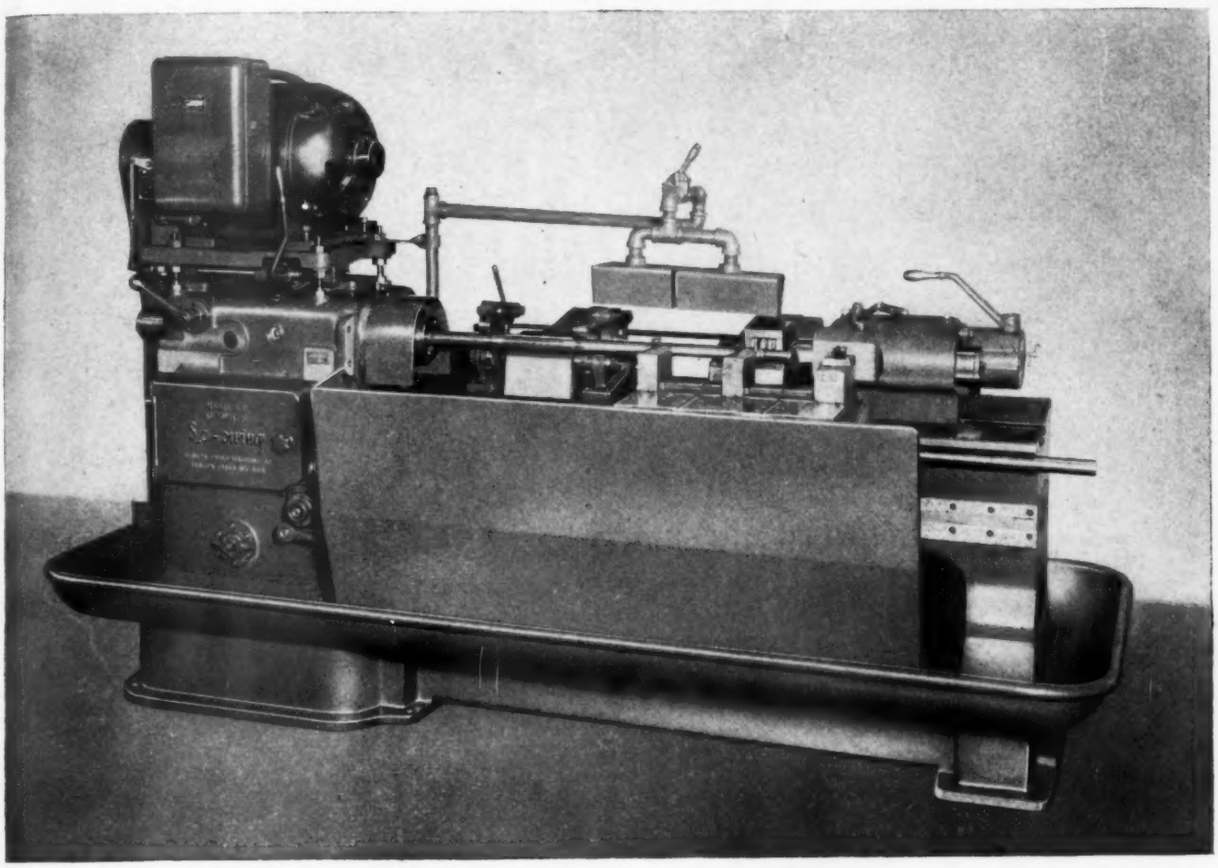
Bulletin 300 B on request

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

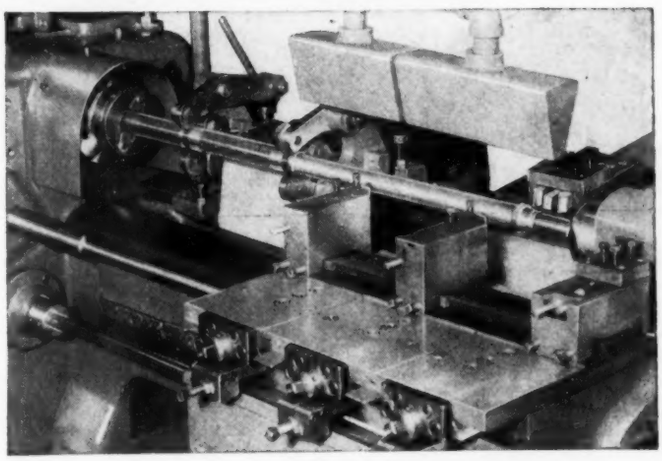


MODEL LR *Lo-swing* LATHE EQUIPPED FOR TURNING LONG, SLENDER SHAFTS

Problem: To provide a fully automatic Lathe capable of turning long, slender tubes with sintered carbide tools.

Solution: In order to reduce the number of tools in contact with the work to a minimum and thus avoid distortion of the tube, this job required a machine with a specially long carriage feed.

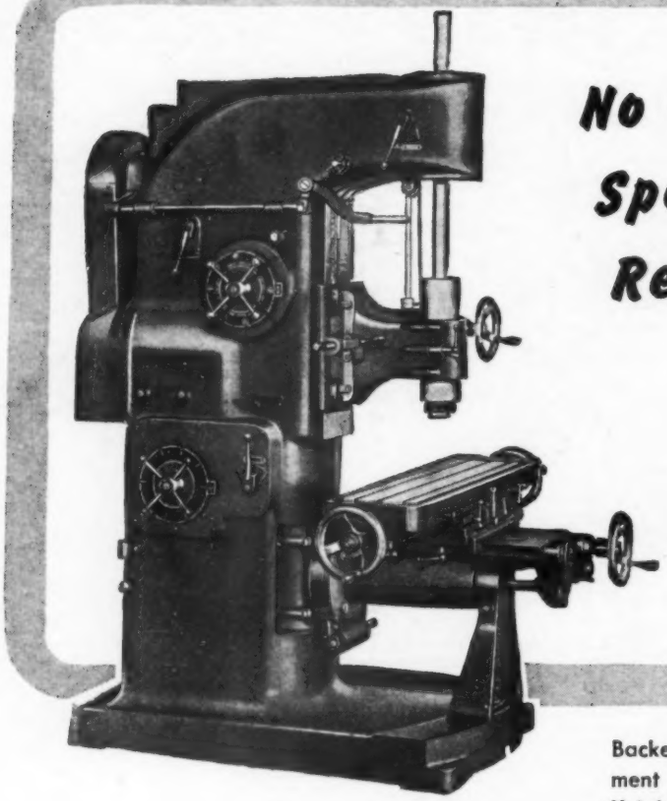
A Model LR Lo-swing was selected for this job and equipped with a special longitudinal feed attachment permitting a maximum carriage travel of 9" which was in excess of that required for this job. The tube is held between centers and driven with a Seneca Falls Automatic Driver which assures a positive balanced drive and also prevents distortion. The work is supported with two-roller steady rests, the rolls of which are in contact with two ground spottings. One-half of the shaft is turned as shown in illustration, after which the shaft is reversed and the opposite end turned.



Another feature of this machine is the three slide carriage having independently cam-controlled slides operated through the Seneca Falls SIMPLIFIED CHANGE-OVER MECHANISM. Each slide may be set for different lengths of cuts by a simple adjustment of gear segments which are fitted with graduated scales corresponding to desired length of cut in inches.

The Model LR Lo-swing Lathe is completely automatic; the operator simply loads and unloads the work and pulls the starting handle.

LATHE NEWS from SENECA FALLS



No Jigs or Special Fixtures Required with a . . .

KNIGHT MILLING AND PRECISION BORING MACHINE

Backed by 35 years of experience gained in the development and manufacture of specialized milling machines, Knight Milling and Precision Boring Machines have built into them, through skillful designing and craftsmanship, qualities and advantages that effect important production savings. Check, for instance, these profit-making features:

✔ **FLEXIBILITY** . . . *An exclusive swiveling, tilting table increases productive time by eliminating special setups and expensive jigs and fixtures. Knight Millers do jobs that ordinarily would require two or more single-purpose machines.*

✔ **CAPACITY** . . . *Sixteen changes in spindle and table speeds, four changes in vertical spindle feeds, plus the table flexibility, all combine to furnish increased working area and capacity.*

✔ **SPEED** . . . *Substantial time savings are gained by reduced setup time, elimination of special setups, quickly adjustable spindle and easy-to-read dial indicators.*

✔ **RUGGEDNESS** . . . *The one-piece backbone-and-base semi-steel, heavily reinforced column casting, combined with engineered precision in all moving parts, provides unusual sturdiness.*

✔ **EASE OF OPERATION** . . . *Simplicity of operation, handy, clear vision controls for direction, speeds and feeds, all contribute to fast, efficient performance.*

Knight Milling and Precision Boring Machines can help you achieve substantial savings in time, labor and equipment costs.

WRITE FOR DETAILS TODAY!

W. B. KNIGHT

MACHINERY COMPANY

KNIGHT VERSATILE MILLERS ACCURATE-RIGID

MORE GOODS for MORE PEOPLE at LOWER COST

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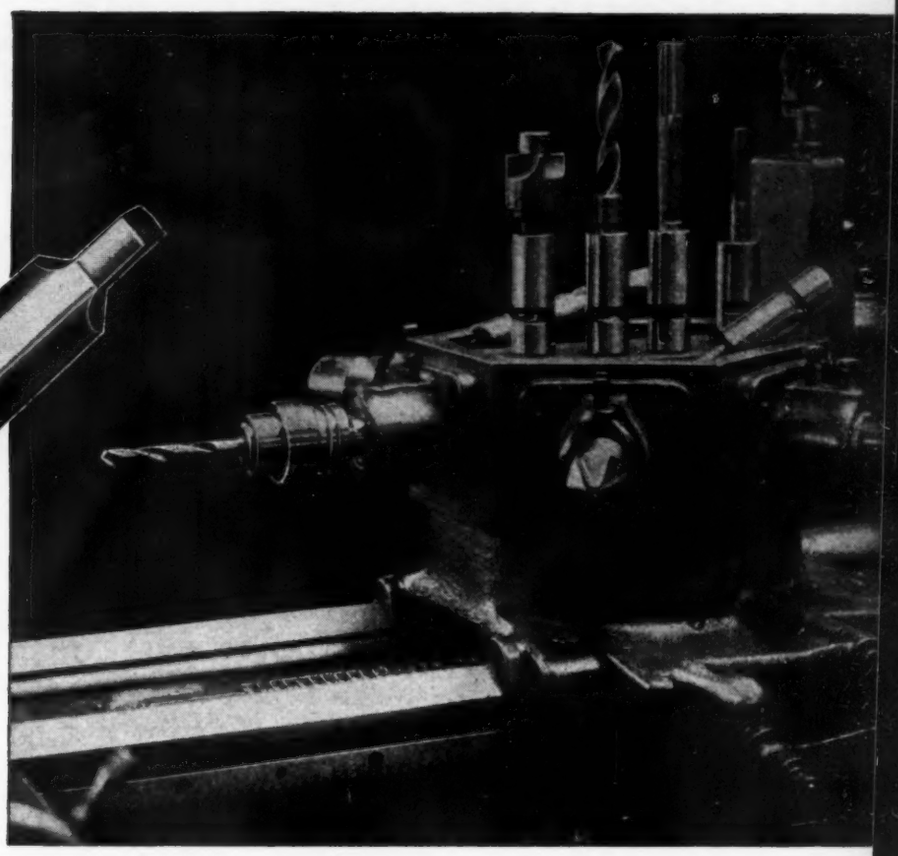
. . . need extra turret lathe stations?

Make them available with

MODERN-MAGIC CHUCK and COLLET EQUIPMENT



Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern-Magic Quick Change Chuck and Collet Equipment has repeatedly proved its value to turret lathe operation where there are not enough openings in the turret to accommodate all the necessary tools for the job.

In effect, Modern-Magic Quick Change Chuck and Collet Equipment makes available as many extra turret stations as are needed. The tools being inserted and removed, one after the other, to take care of each extra operation.

With Modern-Magic Quick Change Chuck and Collet Equipment, tool changes are quickly and easily made. Production is stepped-up and cost reduced.

For complete information covering Modern-Magic Quick Change Chuck and Collet Equipment, send for Bulletin No. M-101

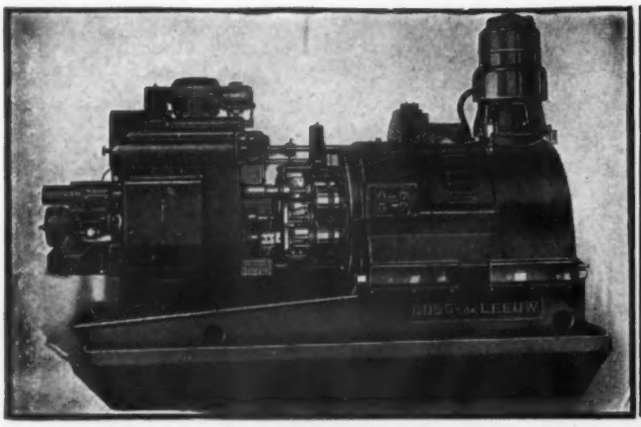
Prompt shipment from stock

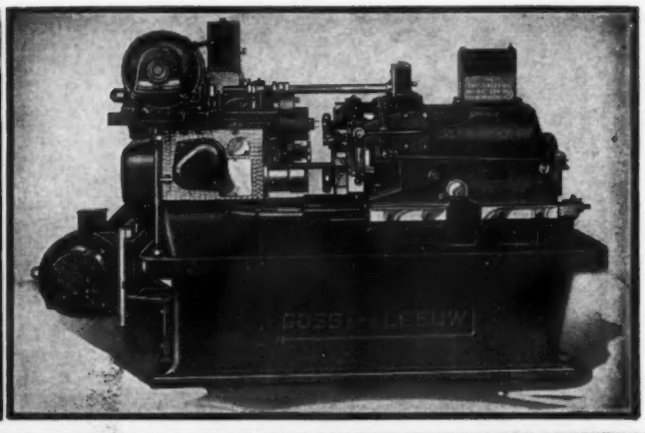
MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK





GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

MOREY *Universal* TURRET LATHES *for* BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

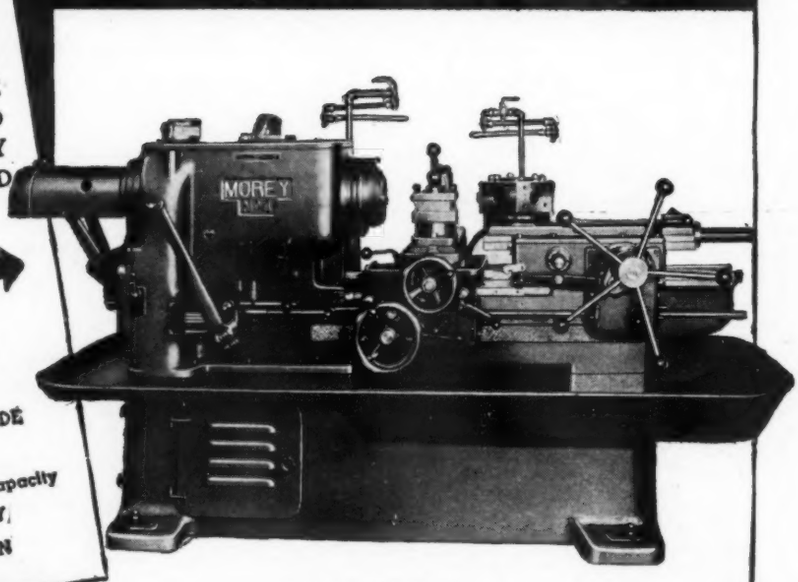
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length . 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity,

ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

CLUTCH USERS...

HERE'S THE MAXITORQ *in detail*

NO TOOLS NEEDED FOR ASSEMBLY • ADJUSTMENT OR TAKE-APART

This exploded view photograph shows ALL parts of a MAXITORQ Floating Disc Single Clutch . . . in the correct order of assembly which is made by HAND . . . and securely locked without the use of tools. The patented Separator Springs (fourth part from top) are inserted between each disc so that they ride free in neutral. Thus there can be no drag, no abrasion, no heating. "In" and "out" are positive . . . disengagement is instantly made with light pressure.

We have made nothing but clutches for 50 years . . . good ones always . . . but the MAXITORQ has taken machine tool manufacturers by storm . . . has been enthusiastically received by makers of all sorts of special machinery . . . and is doing a wonderful job on countless machines and instruments.

For fast power pick-up, smooth, quiet operation, easy adjustment to proper tension and long clutch life, specify MAXITORQ. Send for new Catalog No. A81.

TYPES . . . CAPACITIES

Maxitorq clutches are made in Single and Double types, wet or dry. Pulley & Cut-off Coupling Types also available. Capacities from 1/4 to 15 H.P. at 100 r.p.m.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONNECTICUT

BETTER WORKMEN
ask for the
BEST BLADE
and that's the

STAR HACK SAW BLADE

A master tool for industrial workmen – plant electricians, plumbers, maintenance men, garage mechanics, and even for the handyman householder.

The Star "Moly*" High-Speed Steel blade is recommended for jobs where speed and accuracy must be combined. The Star Unbreakable Special Flexible blade is ideal for all-around cutting where toughness and a certain flexibility are important.

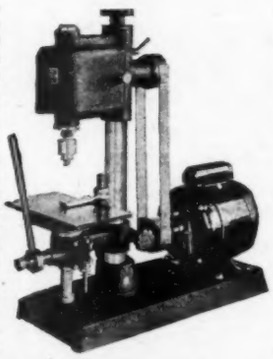
*T. M. Reg.–Blades bearing the name "MOLY" are made only by Clemson Bros., Inc., and affiliated companies.

CLEMSON
CLEMSON BROS., Inc., Middletown, N. Y.
Makers of hand and power hack saw blades, frames, metal cutting band saw blades and the Clemson D-17 lawn machine.

BEFORE YOU BUY A TAPPING MACHINE
Let's Talk About Tapping!

You've had your troubles with poorly designed tappers, as have we all! Tap breakage; want of adaptability; wrong spindle speeds; limited capacity, and a long procession of wanted features that are **needed** in a tapper if it is to earn its keep.

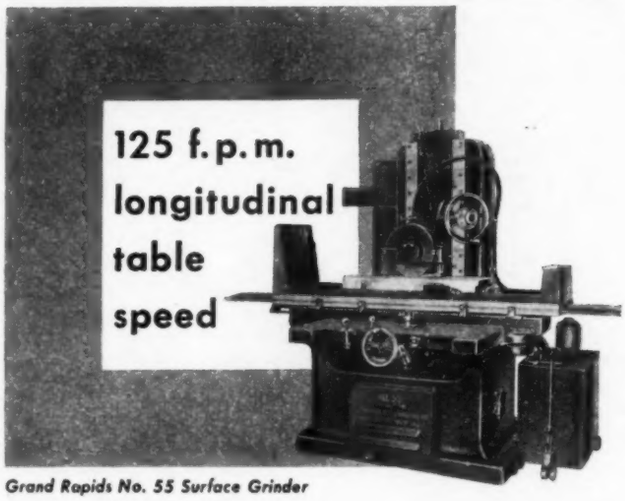
But have you tried the Hamilton Sensitive Tapping Machine? Here is a machine that literally *feels* its way into the hole while the spindle idles in reverse. A machine that taps to the very bottom of blind holes, reverses direction of rotation and withdraws the tap automatically and *without tap breakage.*



Designed for small hole tapping (from the smallest and finest tap to 10-32 inclusive) it has ample travel and clearances and proper power and speed characteristics for intensive production. And more! It's sensitive and versatile. An ideal tool for the tool room.

Let's talk some more about the matter. Write for descriptive literature and ask us some questions . . . we love 'em. Address Department D-T.

THE *Hamilton* TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A



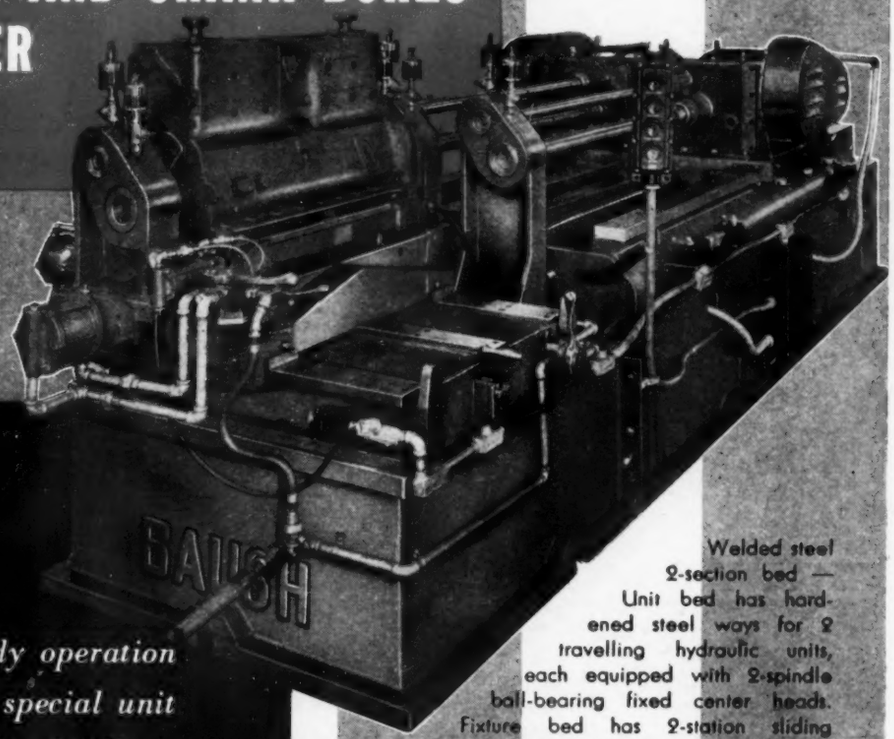
Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

FINISHING CAM AND CRANK BORES IN CYLINDER BLOCKS



Welded steel 2-section bed — Unit bed has hardened steel ways for 2 travelling hydraulic units, each equipped with 2-spindle ball-bearing fixed center heads. Fixture bed has 2-station sliding fixture. Cylinder block to be finished is clamped on elevating platform by bayonet clamps through end cylinder bores. Non-rotating boring bars pass into block to start of boring position — platform lowers to boring position and clears tool bits on bars through part. Bars are fed through cutting cycle and stop. Platform then raises to clear tools when bars are removed. Platform and locating dowels actuated by individual air cylinders, each with control valve. After semi-finish cycle the carriage with the above fixture slides towards rear to final finish boring position when cycle is repeated. Heads and fixture electrically interlocked.

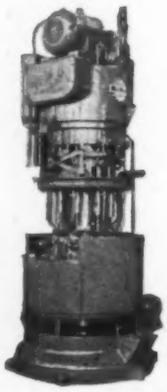
Is a smooth, speedy operation when done with a special unit such as this Baush Special Horizontal Single End Hydraulic Multiple Spindle Boring Machine.

Baush Engineers — backed by over 50 years of experience in solving multiple boring, drilling, tapping and reaming problems — are ready to work with you and develop single purpose machines for speedier, more economical and better production. Phone, wire or write — let us show you how we can help you.

BAUSH

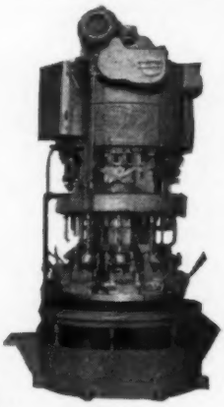
MACHINE TOOL CO.

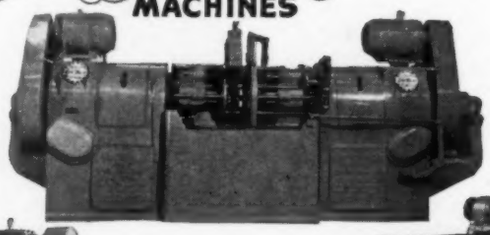
SPRINGFIELD 7, MASSACHUSETTS



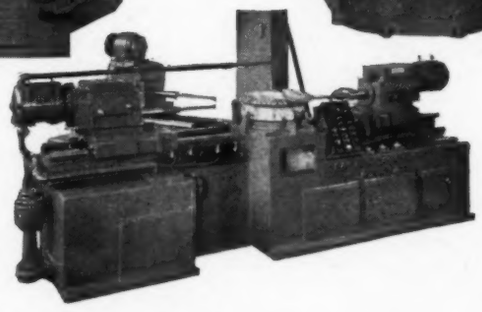
Roto-Matic Drilling MACHINES

VERTICAL AND HORIZONTAL TYPES





MULTIPLE SPINDLES



Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

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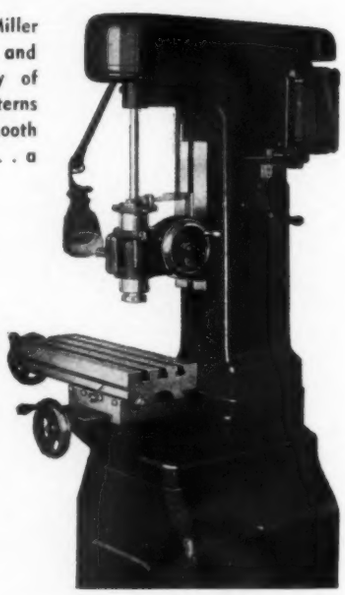
FRICTION SAWING *with* Tannewitz HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

SPEED . . . ACCURACY

FOR EVERY PURPOSE

Toolmakers find the LINLEY Miller and Jig Borer fast, accurate and economical on a wide variety of small dies, jigs, fixtures, patterns and models. It has 8 velvet-smooth spindle speeds to 4250 r.p.m. . . . a speed for every need.



Set up is fast, changeover easy . . . direct micrometer setting eliminates errors . . . grease-sealed bearings need no adjustment . . . all rotating parts carefully balanced. The Linley requires only 2½ sq. ft. of space . . . table size (7" x 17½") is ample.

Save larger machines for their higher rated capacities by using low cost, versatile Linleys.

Bulletin gives full details.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONNECTICUT

We put our heads together

. . . on every Fleximatic* to combine machining operations to best advantage. Such varied operations as drilling, reaming, tapping, hollow milling, spotfacing and counterboring are performed automatically while the operator removes a finished piece and inserts a new one.
Send us samples and prints of your jobs in this range. We will be glad to study them and show you what a Kingsbury Fleximatic can do . . .

to cut your drilling costs

KINGSBURY

KINGSBURY
MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

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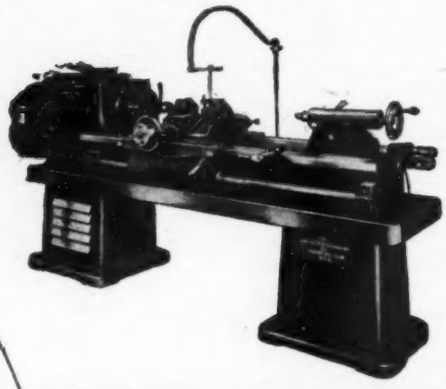
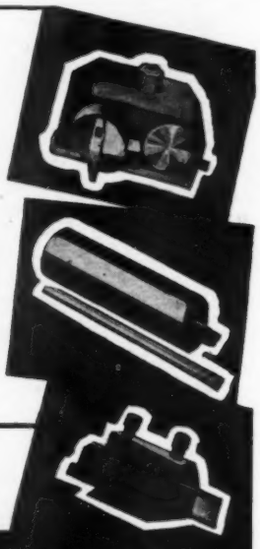
*** KINGSBURY FLEXIMATIC**

—a special purpose machine for combined automatic operations during a single chucking —the result of Kingsbury engineering ability in the use of low cost *standard* Kingsbury drilling and tapping heads on *standard* Kingsbury bases.

40 YEARS OF EXPERIENCE produced
THE NEW COULTER
AUTOMATIC THREADING LATHE





The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

Equipped with disc clutch. . . . Easy to operate. . . . Rigid Construction. . . . Four speed headstock. . . . Return or Idle travel speed has been increased five times cutting speed.

PRODUCTION MACHINES SINCE 1896

Write for full particulars

The James COULTER *Machine Co.*

BRIDGEPORT • CONNECTICUT • U.S.A.

REED-PRENTICE

LATHES
JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS

REED-PRENTICE CORP.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

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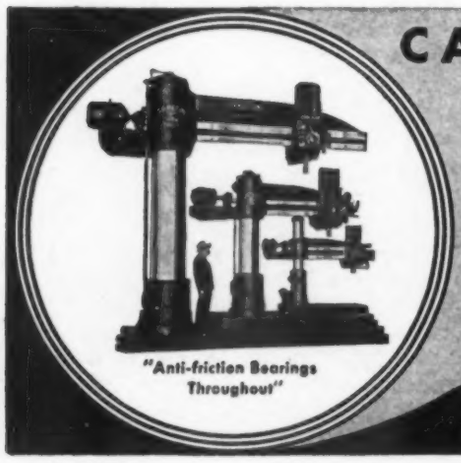
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON

MACHINE TOOL COMPANY

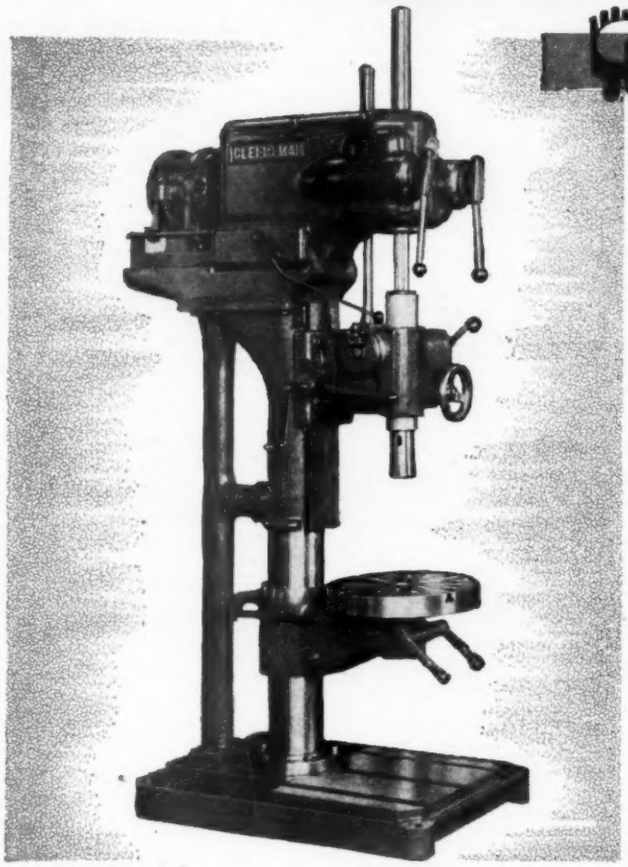
CINCINNATI, OHIO, U.S.A.

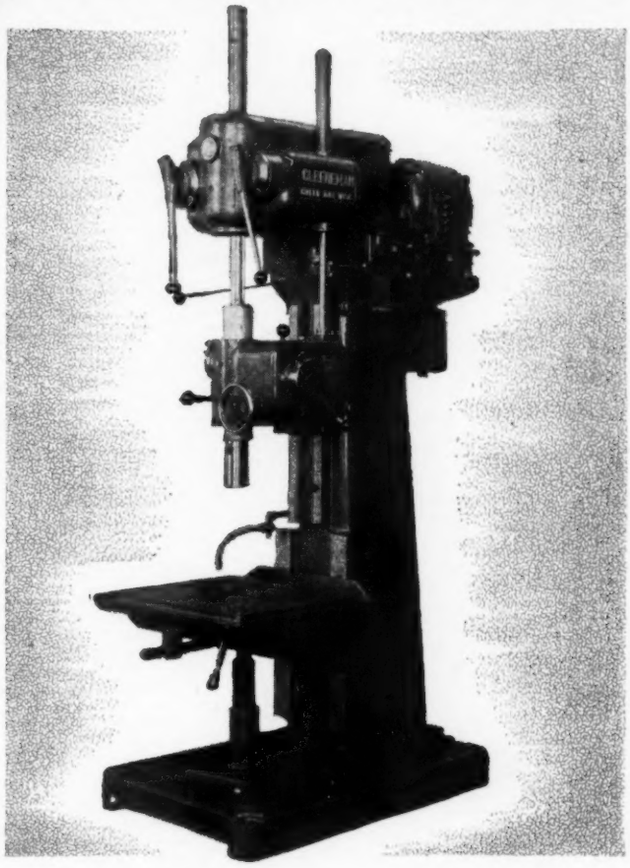
ARMY E NAVY

ACCURACY

SPEED

ADAPTABILITY





All within Arms Reach on

CLEEREMAN DRILLING MACHINES

Attention to every detail in design and construction makes Cleereman Drilling Machines unsurpassed for speed, efficiency, accuracy, adaptability and long working life. All major controls are within arms' reach of the operator to improve the efficiency of operation—which means *more* pieces, in *less* time, at *lower* cost! Write today for catalogs giving complete description and construction details of Cleereman Round and Box Column Sliding Head Drilling Machines.

Cleereman Machine Tool Co. of Green Bay, Wisconsin, organized in 1908 and affiliated with Bryant Machinery & Engineering Company, manufactures fine machine tools including Cleereman Precision Jig Borers and Cleereman Drilling Machines.

BRYANT
Machinery & Engineering Company

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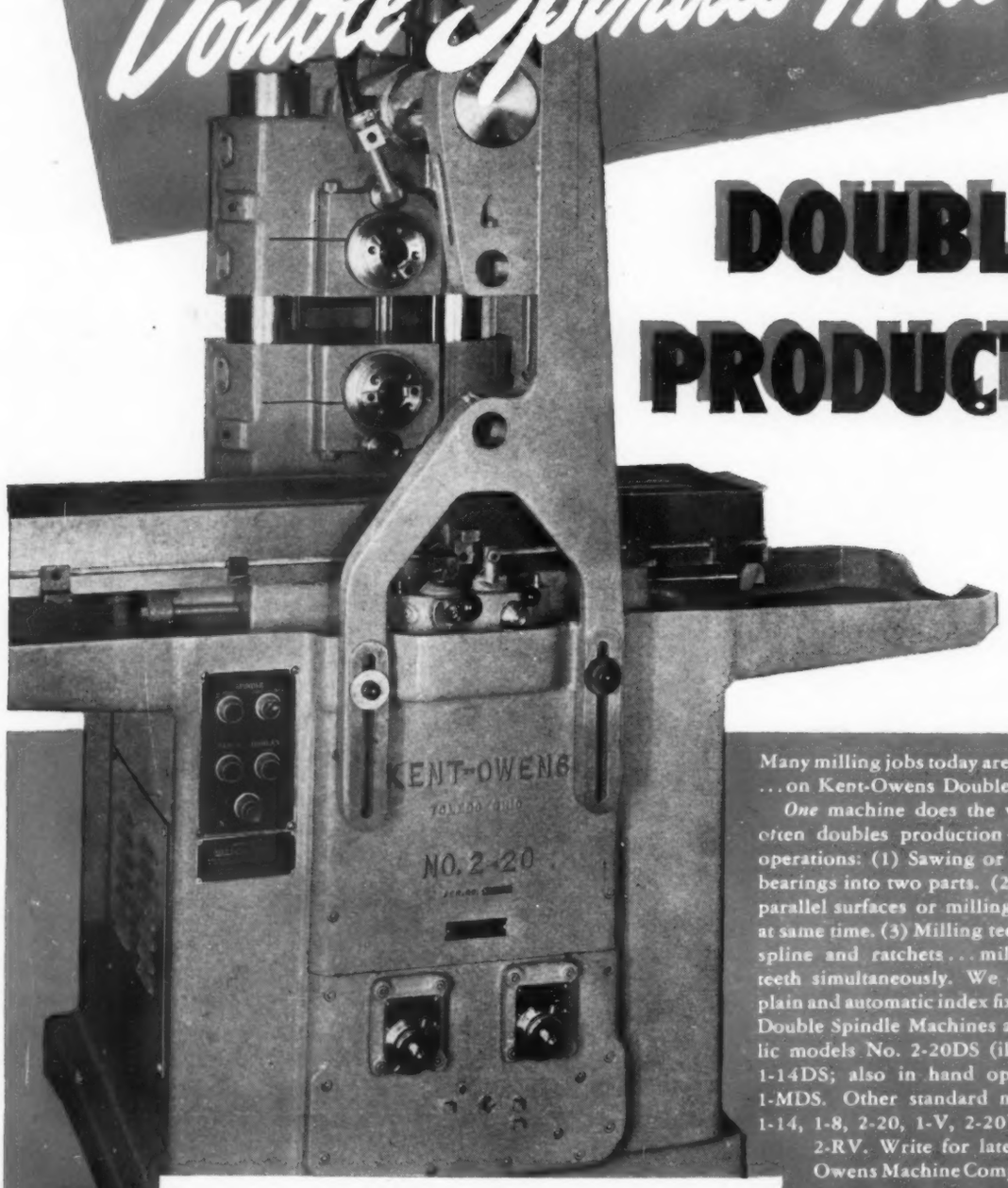
ANOTHER KENT-OWENS STANDARD MACHINE

Double Spindle Miller

DOUBLES PRODUCTION



Many milling jobs today are handled *doubly fast* . . . on Kent-Owens Double Spindle Machines!

One machine does the work of *two* — and often doubles production — on these typical operations: (1) Sawing or splitting full circle bearings into two parts. (2) Face milling two parallel surfaces or milling two parallel slots at same time. (3) Milling teeth in gears, cutters, spline and ratchets . . . milling two opposite teeth simultaneously. We design and furnish plain and automatic index fixtures for this work. Double Spindle Machines available in hydraulic models No. 2-20DS (illustrated) and No. 1-14DS; also in hand operated model No. 1-MDS. Other standard models include the 1-14, 1-8, 2-20, 1-V, 2-20V, 1-14V, 1-M and 2-RV. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

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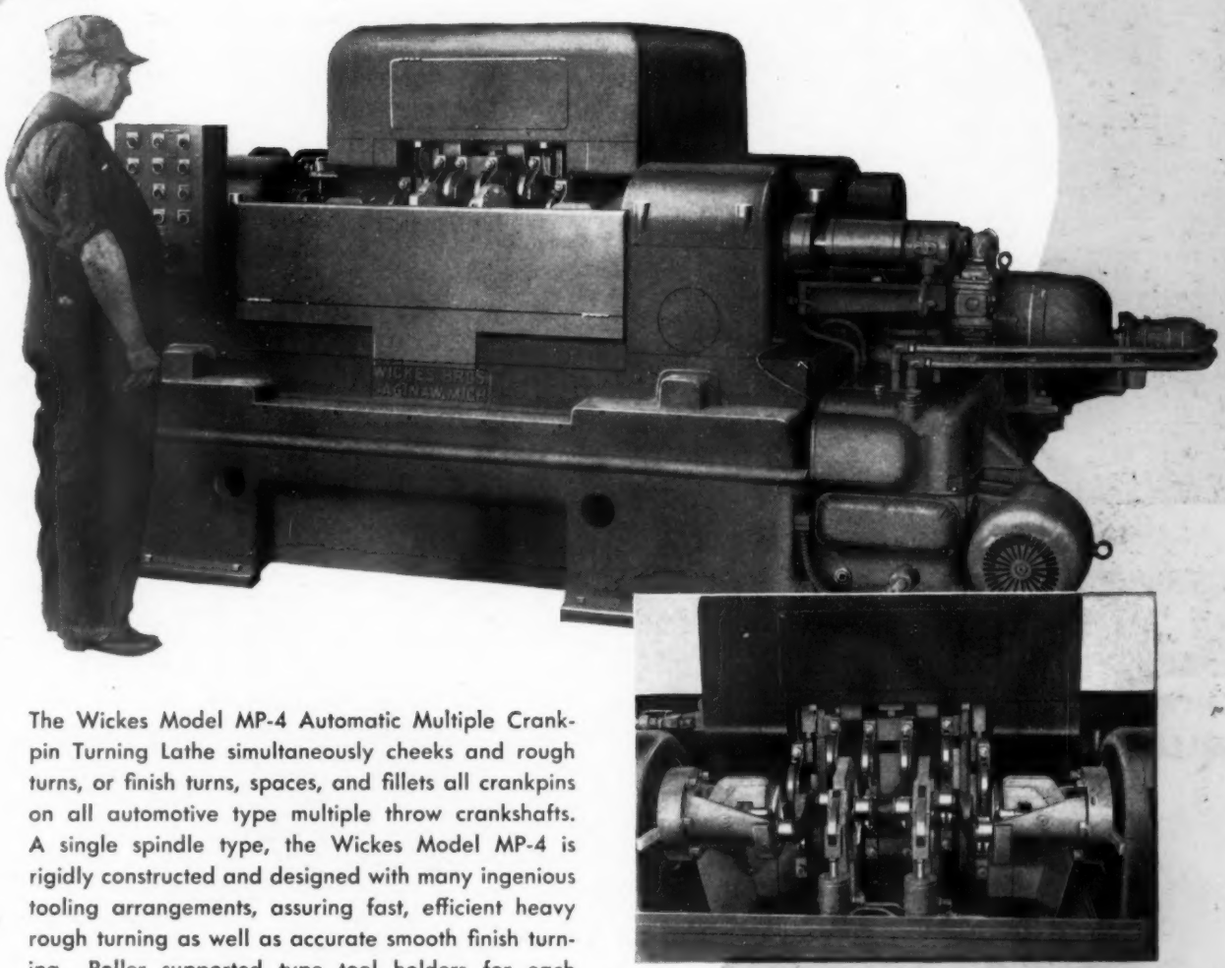
Specify

KENT-OWENS

Milling Machines

WICKES model MP-4 lathe

AUTOMATICALLY MACHINES CRANKPINS ON ALL TYPES OF AUTOMOTIVE CRANKSHAFTS



The Wickes Model MP-4 Automatic Multiple Crankpin Turning Lathe simultaneously cheeks and rough turns, or finish turns, spaces, and fillets all crankpins on all automotive type multiple throw crankshafts. A single spindle type, the Wickes Model MP-4 is rigidly constructed and designed with many ingenious tooling arrangements, assuring fast, efficient heavy rough turning as well as accurate smooth finish turning. Roller supported type tool holders for each crankpin. Hydraulically operated pot chucks hold and drive crankshaft from each end. Hydraulically operated steady rests. Hydraulic tool feed. Completely automatic operating cycle. Cam operated synchronized variable speed and feed mechanism maintains both lineal cutting speed and feed per revolution at maximum throughout machining cycle. Transfer switch permits manual operation when desired. Wickes manufactures a complete line of lathes for turning every type of crankshaft. Send us your problems, and our engineers will recommend the Wickes lathe best suited to your needs.

Wickes

WICKES BROTHERS • SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

New! **REED**
Cylindrical-Die
THREAD ROLLER
MODEL A22

The ROLLED THREAD DIE CO. announces the new Model A22 REED Cylindrical-Die THREAD ROLLER . . . worthy successor to the Model 21 which has for several years demonstrated the advantages of *Reed-pioneered triple-die rolling.*

The unusual range and flexibility of the A-22 provide for low production and inspection costs on a large variety of hollow parts, short threads on top-heavy parts, tapered threads, threads close to shoulders, and other difficult parts made of materials ranging from soft non-ferrous metals to semi-hard alloy steels.

Write for Bulletin A22-1 which contains complete specifications.

For **PRECISION**
Threading - Knurling - Forming - Burnishing - Serrating

ROLLED THREAD DIE CO.
Thread Rolling Dies and Machines
237 Chandler St., Worcester 2, Mass.

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
1029 SWEITZER AVENUE, AKRON, OHIO

GREENFIELD

No. 4
CUTTER and REAMER GRINDER
•
A Sturdy Machine of Wide Utility

Available in PLAIN and UNIVERSAL TYPES

Swing over table—8½"
Table—5½" x 28"
Longitudinal Table Travel—16"
Cross Feed—6"
Vertical Feed—7"
Chuck Capacity—4"

The Greenfield No. 4, with the variety of attachments available, offers a scope of usefulness in the shop or tool room which enables it to handle practically any grinding operation within its capacity.

Standard is integral with base and broad knee is splined to standard. Sleeve of elevating hand wheel is provided with graduations reading in thousandths.

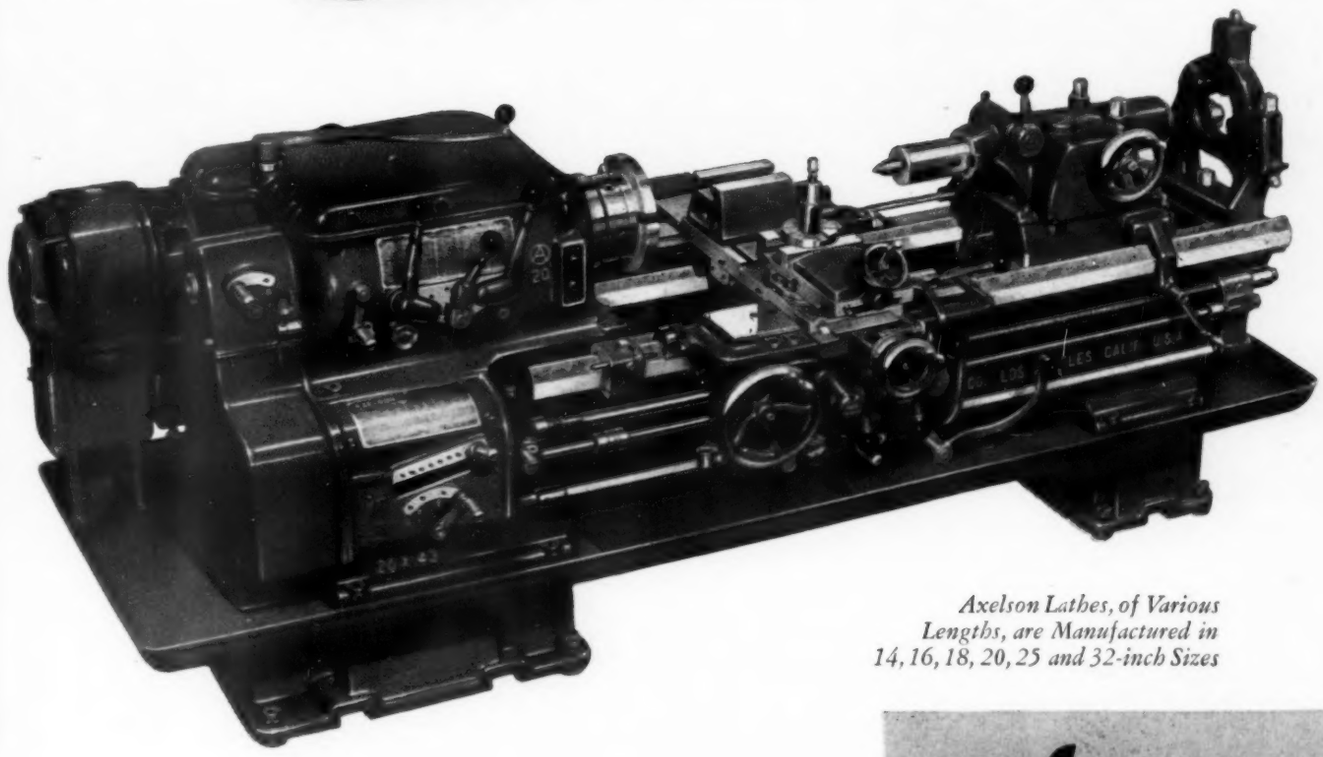
Other features include graduated head swivelling 90° each side of center. Wheel head designed for heavy work; spindle of sturdy construction; table rests full length on longitudinal slide on which it swivels. Attachments provide for cylindrical and internal grinding.

Write for illustrated bulletin giving complete specifications and details on attachments available

PRODUCTION MACHINE CO.
Manufacturers of Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

For the Long Haul

IN METAL TURNING



Axelson Lathes, of Various Lengths, are Manufactured in 14, 16, 18, 20, 25 and 32-inch Sizes

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As costs rise in industry, manufacturers know that they must develop the utmost efficiency and reliability in their machine shops... For metal turning, the urgent need of thoughtful operators is for a durable, versatile, fast and dependably accurate heavy duty lathe... To meet this need, the buyer will find in the *Axelson Heavy Duty Lathe* a machine which long has earned the right to confidence both in its performance and profitable operation... The 24-speed selective type geared head *Axelson Lathe* will prove itself *for the long haul* on big or little jobs... Application, for over thirty years, of the quality first principle, has kept pace with production needs which today call for supreme performance... For precision, speed, minimum per-piece operating cost and complete satisfaction, specify *Axelson Lathes* for *your* machine shop.

Axelson

LATHES

DEPENDABLE FOR OVER A QUARTER CENTURY

Consult your classified directory for the nearest Axelson dealer in your vicinity, or write, wire or telephone the Axelson Plant at Los Angeles or St. Louis.

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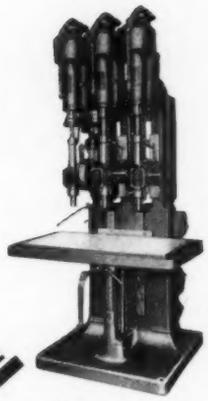
Avey FEATURES mean A BETTER DRILLING MACHINE

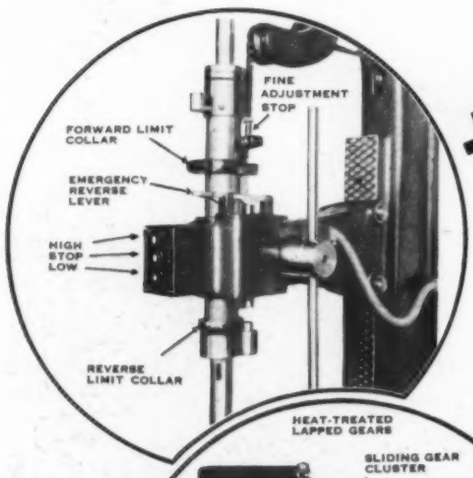


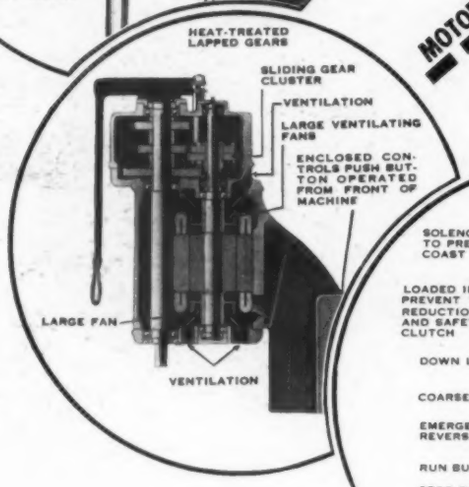
HAND FEED REVERSING MOTOR FOR TAPPING

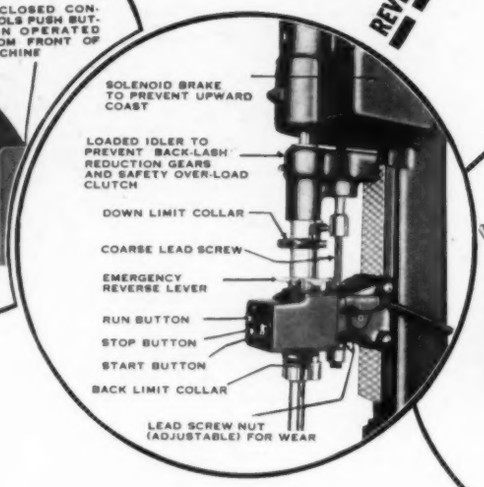
MOTOR & GEAR BOX CONSTRUCTION OF 6 SPEED MACHINE

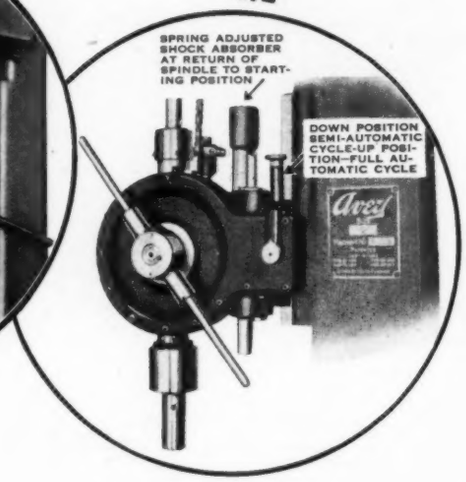
REVERSING MOTOR—POSITIVE LEAD SCREW TAPPING

SINGLE LEVER CONTROL—AVEYMATIC POWER FEED








SPRING ADJUSTED SHOCK ABSORBER AT RETURN OF SPINDLE TO STARTING POSITION
DOWN POSITION SEMI-AUTOMATIC CYCLE-UP POSITION—FULL AUTOMATIC CYCLE
Avey

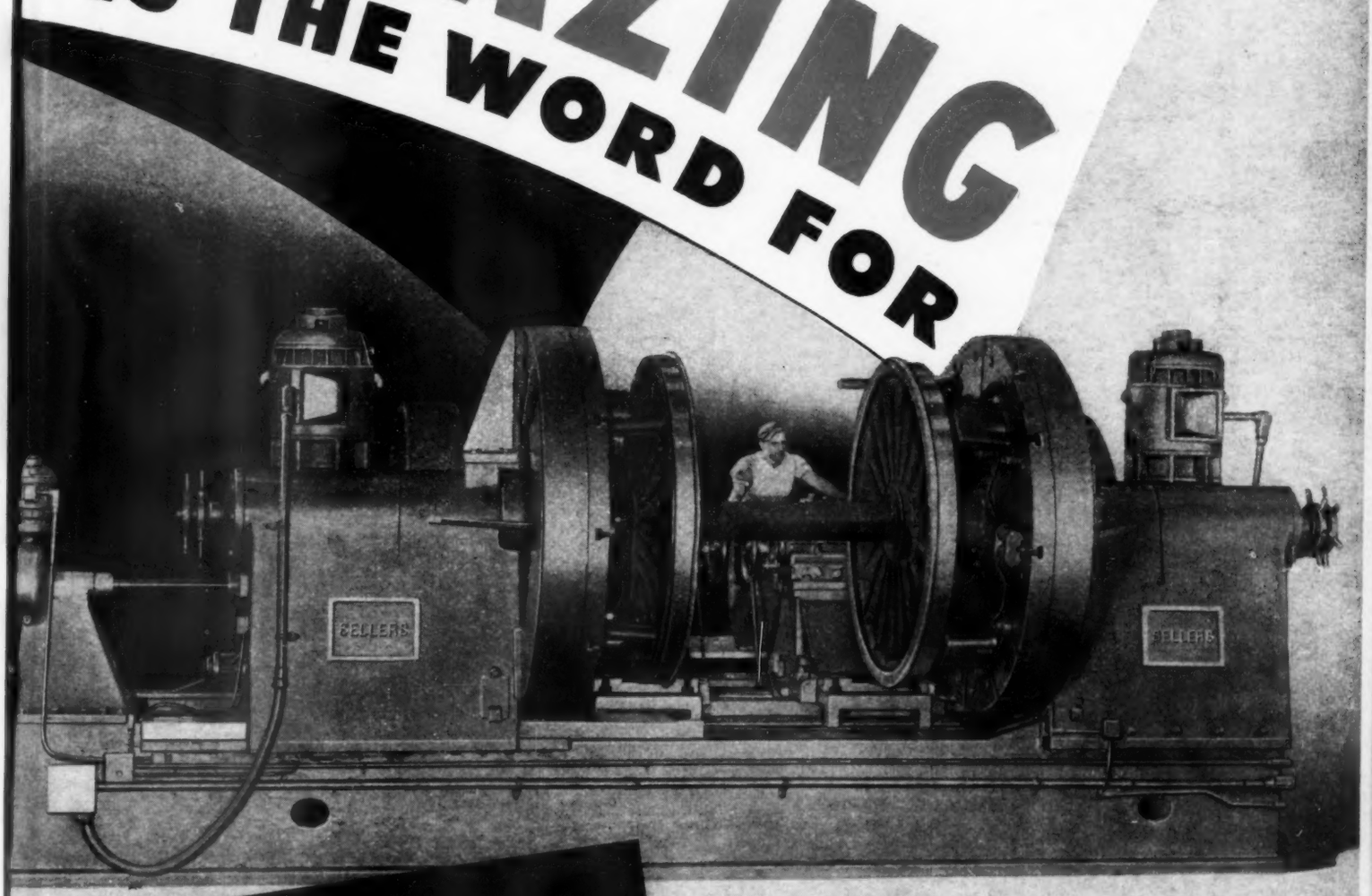
The Avey Type MA-6 is made in the following capacities

No. 2— 7/8" capacity in cast iron
No. 3—1 1/4" capacity in cast iron

Any spindle of MA-6 can be arranged with any one of above FEATURES giving ease of operation —ideal for production set up.

Avey DRILLING MACHINES
CINCINNATI, OHIO

AMAZING
IS THE WORD FOR



The New
SELLERS
DUAL DRIVE
90" DRIVING
WHEEL LATHE . . .

Equipped with Hydraulic Driving Dogs

Smooth finish turret tools

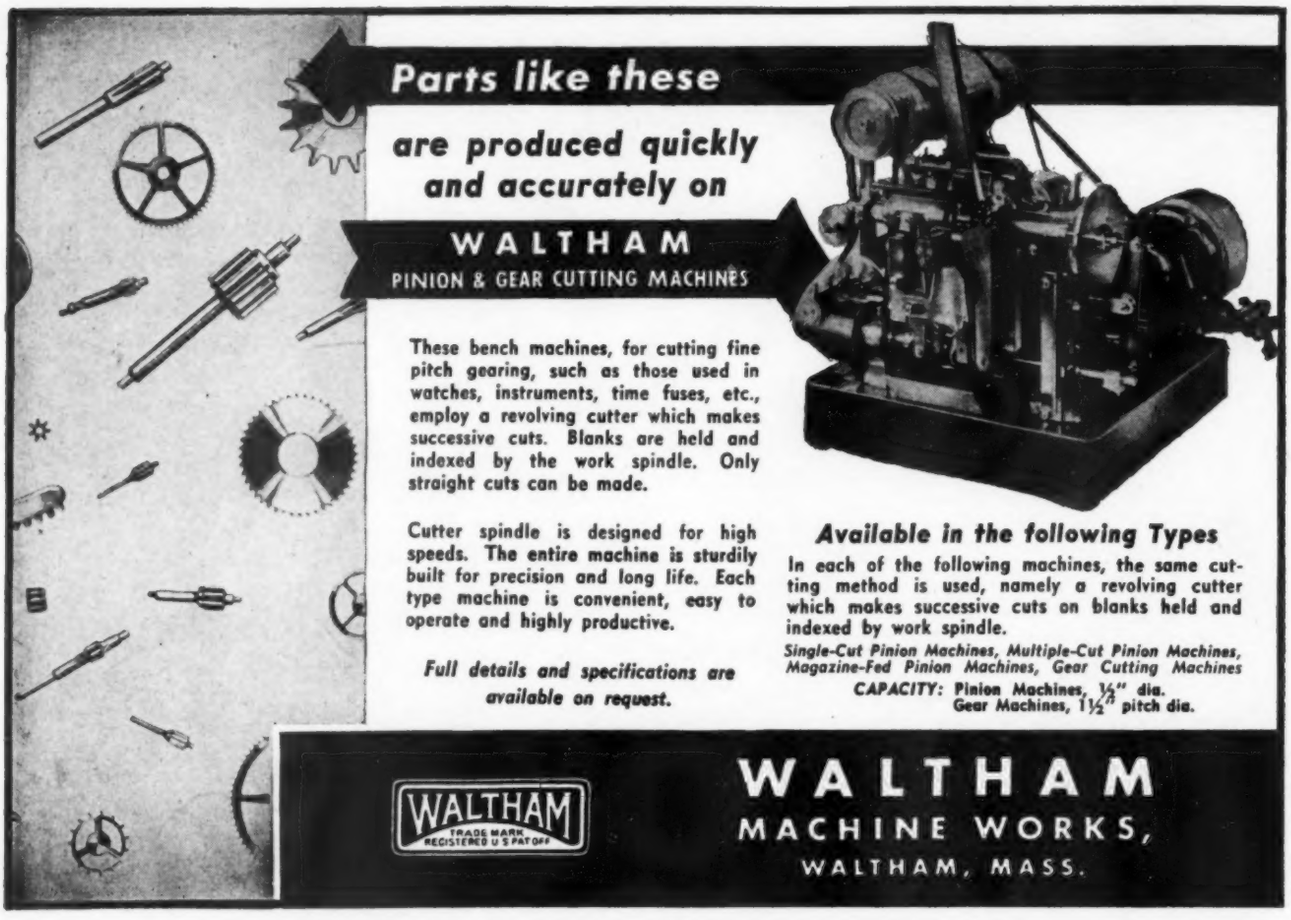
Anti-Friction Bearings throughout

No Vibration
Fast Production
Closer Tolerances

SELLERS

WM. SELLERS & COMPANY, INC.

1651 HAMILTON ST., PHILADELPHIA 30, PA.



Parts like these

are produced quickly and accurately on

WALTHAM
PINION & GEAR CUTTING MACHINES

These bench machines, for cutting fine pitch gearing, such as those used in watches, instruments, time fuses, etc., employ a revolving cutter which makes successive cuts. Blanks are held and indexed by the work spindle. Only straight cuts can be made.

Cutter spindle is designed for high speeds. The entire machine is sturdily built for precision and long life. Each type machine is convenient, easy to operate and highly productive.

Full details and specifications are available on request.

Available in the following Types

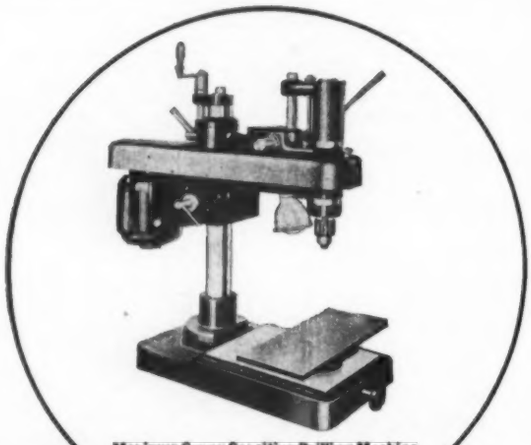
In each of the following machines, the same cutting method is used, namely a revolving cutter which makes successive cuts on blanks held and indexed by work spindle.

Single-Cut Pinion Machines, Multiple-Cut Pinion Machines, Magazine-Fed Pinion Machines, Gear Cutting Machines

CAPACITY: Pinion Machines, ¼" dia.
Gear Machines, 1¼" pitch dia.

WALTHAM
TRADE MARK REGISTERED U S PAT OFF

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.



Maximus Super Sensitive Drilling Machine

TO DRILL HOLES THAT ARE

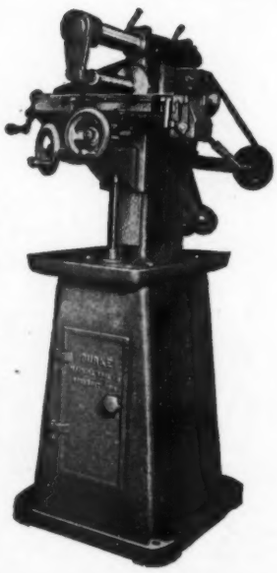
TINY *and* ACCURATE

Instrument makers, and others requiring equipment for tiny hole, precision drilling on a production basis, are increasingly turning to the Maximus, Super Sensitive Drilling Machine as the ideal tool. **Sensitive and versatile,** with ample clearances, spindle speeds and safety factors, this sturdy, precision built machine drills holes from .004" to $\frac{5}{16}$" diameter with unique accuracy and on a high production schedule. Write for literature, specifications and price list. Address Department D-M.

THE *Hamilton* TOOL COMPANY
SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS
NINTH STREET AT HANOVER · HAMILTON · OHIO · U · S · A

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



These small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

LOOK FOR *This* NAME ON *Your* TAPS

It gives you positive assurance of clean, accurate threads at low cost per hole.

Plus

ALL THESE ADDED VALUES

COLD-TEMPER

Every Threadwell High Speed Tap treated at 120° below zero to give it extra hardness without brittleness.

GREASELESS RUST-PROOFING

that keeps Threadwell Taps clean and shining—never messy or sticky to handle.

POLISHED FLUTES

that provide extra protection against chip clogging and consequent tap breakage.

COLOR "I-DOT-IFICATION"

for instant identification of cut thread taps (red dot), commercial ground (white dot) and precision ground (blue dot).

PACKED IN TAP-CAPSULES

of transparent plastic that protect ground threads while making it easy to select type and size without unwrapping.

"PERSONAL ATTENTION" SERVICE

from the factory and from your Threadwell distributor so that your individual tap needs are promptly and efficiently met at all times.

REMEMBER: Threadwell COLD-TEMPER Taps cost no more than any other high speed taps. Why not try them and see what these advantages mean to you.

Threadwell Taps are sold exclusively through Mill Supply Distributors.

THREADWELL DISTRIBUTORS ARE IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA

Export Distributors

Canada — Bridge Machinery Company, Montreal

England — Skylux, Ltd., London

Brazil — Alfredo Kramer & Cia. Ltda., Rio de Janeiro, Sao Paulo

W. Picard, Sierra Gorda 180
Lomas, Seccion Lago, Mexico, D. F.

John H. Graham & Co., Inc. of New York City

THROUGHOUT THE REST OF THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

PACEMAKERS OF PRODUCTION!

DESIGNED AND BUILT BY BUHR FOR MULTIPLE OPERATIONS.

Retooling old machinery for modern production lines is no problem for Buhr Engineers are specialists on multiple-spindle drilling, reaming and tapping operations. Many seemingly impossible production problems have been solved quickly by our staff of qualified men.

TYPICAL BUHR RETOOLING

1—24 Spindle Drill Head arranged with 12 Spindles for Drilling and 12 Spindles for Reaming.

1—2 Compartment Bushing Plate with automatic cut off of compound in non-operating position.

1—Holding Fixture mounted on rolling type index. Loading position left, drilling center and reaming position right.

All gears in Buhr Drill Heads are shaved and induction hardened for quieter, frictionless operation, lower power consumption and more trouble-free production hours.

RETOOL *with* BUHR

BUHR MACHINE TOOL COMPANY

GREEN and DAVIS STS.
ANN ARBOR, MICH.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from 1/2" to 3 1/2". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/10" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

RANDALL & STICKNEY

Universal Gauge

for rigid inspection of a wide range of parts . . .

An almost unlimited use is offered by this instrument for inspecting duplicate parts in quantity or any small parts with flat surfaces or recesses.

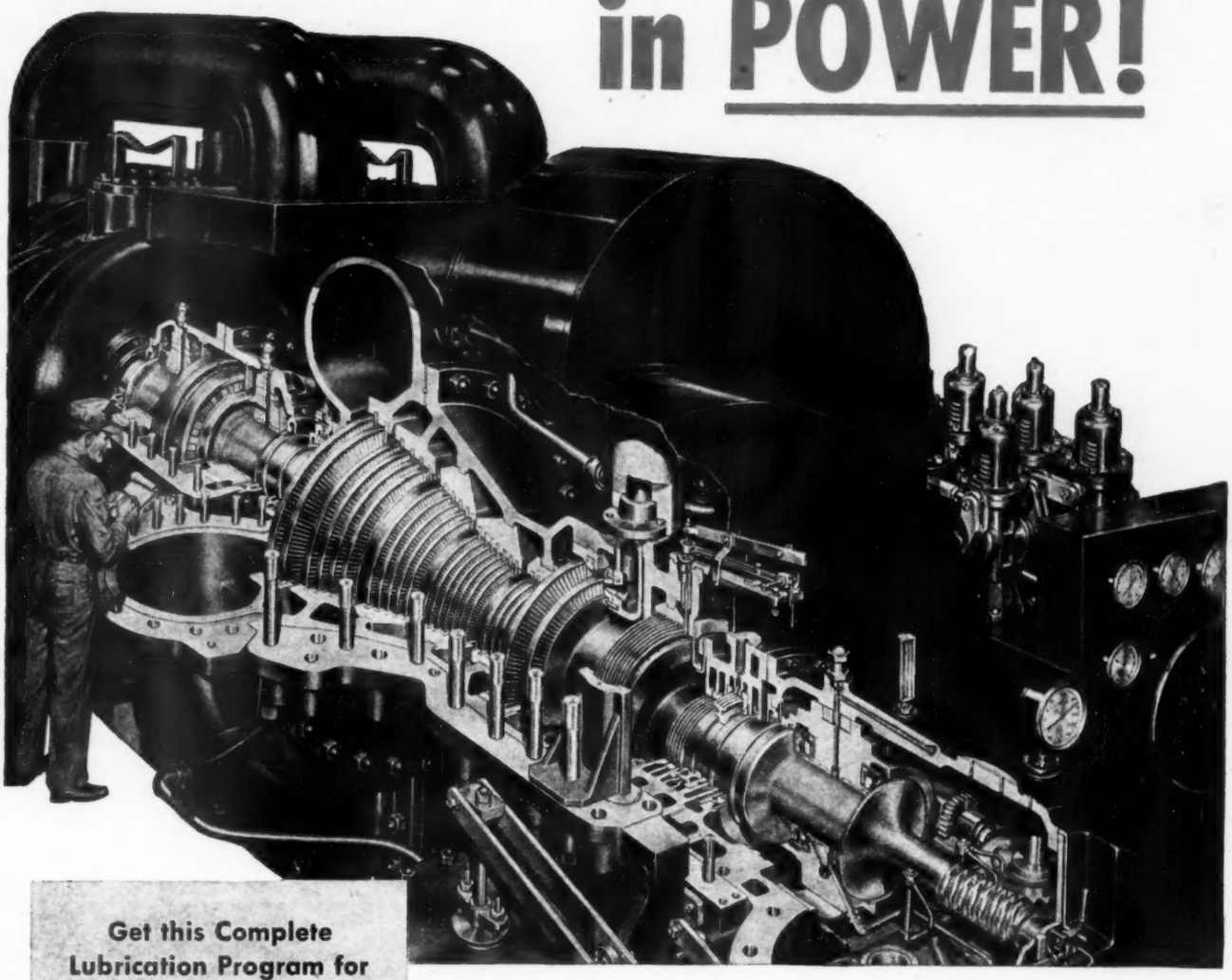
Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch; height 9¾"; weight 8 lbs. 1¼ oz.; depth from frame to spindle 1⅝".

Full details on request

Can be supplied with sliding head and table; also on a stand with throat 5" deep.

FRANK E. RANDALL CO.
Makers *Waltham 54, Mass.*

Proof of a Payoff in POWER!



Get this Complete Lubrication Program for all your machines

- Lubrication Study of Your Entire Plant
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel
- Progress Reports of Benefits Obtained

GARGOYLE Lubricants

● To get more power out of every ton of coal, turbine manufacturers have boosted the speeds, pressures and temperatures inside modern machines like this. Today, steam pressures have reached beyond 2,000 pounds per square inch. Temperatures have soared as high as 940° F.

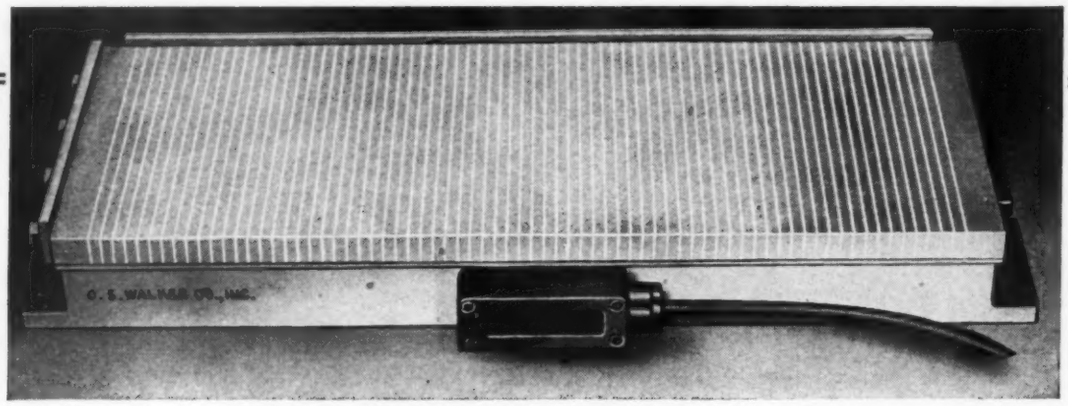
This stepped-up temperature has posed a difficult problem for lubricating oil. To meet it, four years ago Socony-Vacuum developed a great new turbine oil and placed it in turbines where other oils had been deteriorating to the point of failure in short periods of time.

The new oil is now giving record-breaking performance in all of these turbines. Analyses show negligible change . . . or no change at all . . . after months and even years in this severe service.

This means more constant, dependable power output and lower ultimate lubrication costs . . . important factors not only for turbines, but also for every other machine. Socony-Vacuum's complete lubrication program assures these benefits for your entire plant. Get this program now for a payoff in production and profits.

Socony-Vacuum Oil Co., Inc.

and Affiliates: Magnolia Petroleum Co., General Petroleum Corporation



The above illustration portrays one of the many *Walker* basic designs.
Defying duplication of its magnetic characteristics and designs, it has withstood the test of years of service.

The use of *Walker Chucks* insures increased production and low labor costs.
These Chucks are available in all sizes.
Walker's has a Chuck for every known application.
Walker engineers invite you to submit your problems at no obligation to yourself.

Walker Chucks

O. S. WALKER CO.
INCORPORATED
WORCESTER 6, MASSACHUSETTS

ORIGINAL DESIGNERS AND BUILDERS OF MAGNETIC CHUCKS
MAGNETIC CHUCKS • GRINDING MACHINES

INTERCHANGEABILITY

Your KEY to MASS PRODUCTION
Will Speed up Drilling and Lower Costs

A. S. A. STANDARD
PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.

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BUFFALO, N. Y. — John J. Kelly — CLeveland 8196
CLEVELAND, O. — J. W. Mull, Jr. — HEnderson 6113
• DETROIT, MICH. — James W. Booth — TEmple 1-4040
INDIANAPOLIS, IND. — J. W. Mull, Jr. — Riley 9393
LOS ANGELES, CALIF. — Walter W. Millar — PRospect 2687
NEW YORK, N. Y. — Carlton Eberhard — Wisconsin 7-9193
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PITTSBURGH, PA. — J. W. Mull, Jr. — MAyflower 3177
SEATTLE, WASH. — H. F. Soderling Co. — GArfield 8386
• STRATFORD, CONN. — Ellsworth St. & Sup. Co. — BRidgeport 7-3317
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• Stock carried at these locations

ACCURATE BUSHING CO.
440 North Ave., Garwood, N. J. • WEstfield 2-2415

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS

ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All parallels fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.

ANTON PARALLELS COME IN THREE STANDARD SIZES—

- ¼" Thick x 6" Long—½" to 1-13/16" High in Steps of 1/16" $85.00 per set—22 pairs.
- ½" Thick x 6" Long—1-3/16" to 1-13/16" High in Steps of 1/16" $71.00 per set—11 pairs. $106.00 per set of 11—3 each size.
- ¾" Thick x 6" Long—1-3/16" to 1-13/16" High in Steps of 1/16" $88.75 per set—11 pairs.

Price per set includes a large Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

ANTON MACHINE WORKS

52 Sands St. Tel. TR. 5-8092 Brooklyn 1, N. Y.

DEALERS: Morris Abrams, 196 Centre St., New York 13, N. Y.; Arrow Machine Tool Co., Inc., 251 Richmond St., Providence, R. I.; Charles R. Yerger & Co., 7800 Bayard Road, Philadelphia 19, Pa. Hansen & Hasie, 135 Myrtle Ave., Brooklyn 1, N. Y.

SAVE TIME AND MONEY

NICHOLSON EXPANDING MANDRELS cut costs 2 ways: by saving the time lost in making or looking for solid arbors; by promoting precision. Set of 19 does the work of 209 solid arbors. Used the nation over. Bulletin 1043.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

Here's why You can expect

Less Down-time
Better Production
Greater Savings

with

ace
(GROUND-FROM-THE-SOLID)
drills

Recently a multiple spindle drilling operation in an automotive plant was fast becoming a bottleneck because of inefficient drill performance.

Ace Drill Corporation, one of nine drill makers called in an effort to remedy the trouble, supplied the manufacturer with a number of Ace Drills taken at random from stock.

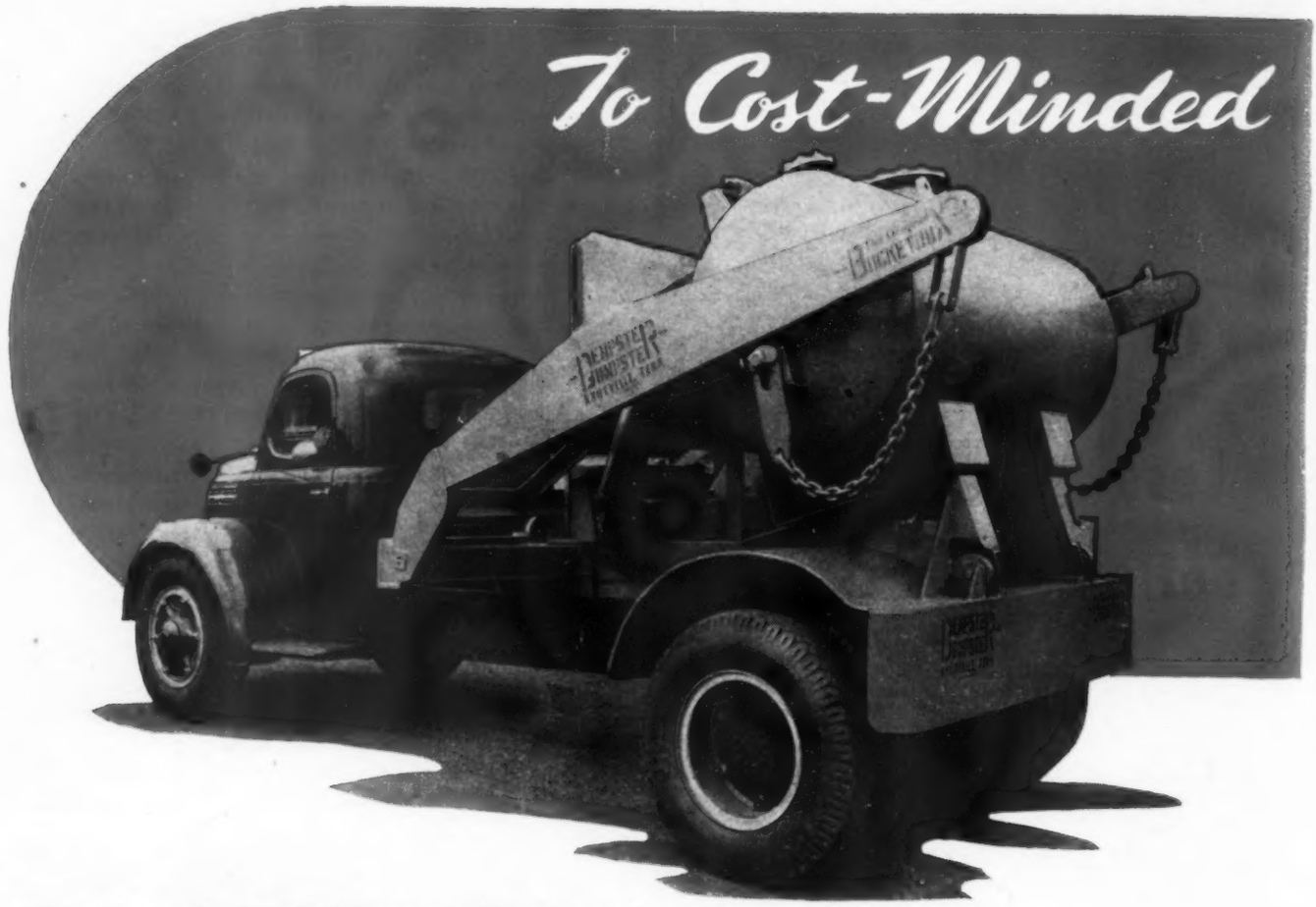
Although this increased production 100%, the Ace Drill salesman, still not satisfied, continued his study of the problem. Finally he recommended Ace cobalt high speed drills which reduced down-time for the machines from 87½ hours to 19¾ hours for a like period of time.

You too will experience better drill performance with Ace Drills because Ace quality remains consistently high. Uniform hardness is achieved by passing 12 ft. long bars of high speed steel through a double dip hardening furnace in a continuous line—bar after bar. These cylindrical bars having a uniform cross section can be heat treated far more effectively and uniformly than a fluted drill having both heavy and very thin cross-sectional areas which restrict heat treat temperatures.

ace drill CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

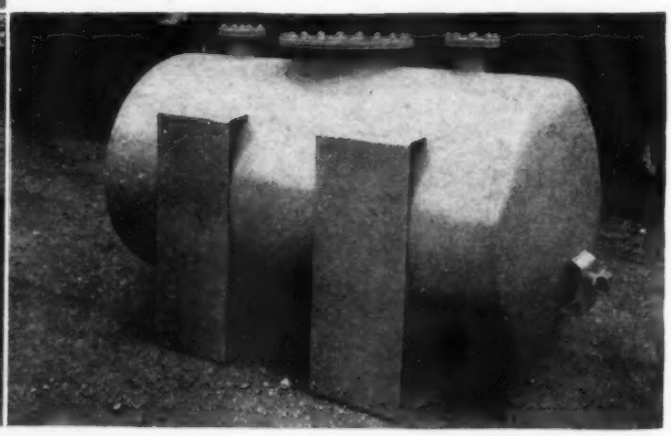
13638 JENNINGS STREET DETROIT 27, MICH.



TANKS FOR GASES AND LIQUIDS

Dempster-Dumpster service is unlimited. Here you find it handling 500 gallon rubber lined acid tanks. Its next job at this plant may be hauling a 10 yd. oval top body loaded with trash or rubbish. Next, perhaps, a 4 yd. tilt type body loaded with a different material, etc.

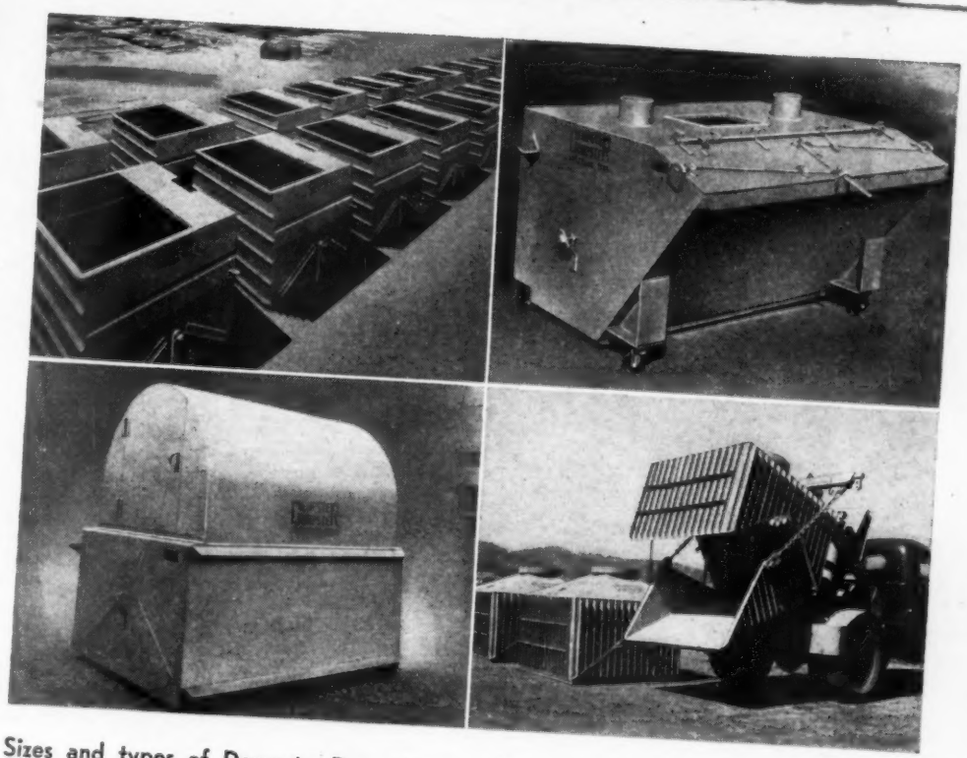
Shown above is a loaded tank in carrying position. At left, tank is hoisted for placing in carrying position or for unloading on platform or ground. Below, close-up of tank showing self-supporting stand and lifting pins. Other similar tanks are available for gases, air, and various liquids.



Materials-Handling Executives

The rapid pace at which leading industrial firms have adopted the Dempster-Dumpster system of materials handling by truck is due strictly to its ability to reduce costs.

The Dempster-Dumpster system, fundamentally, comprises one truck equipped with a Dempster-Dumpster hoisting unit which serves any number of detachable bodies. In many installations this system has eliminated the investment and up-keep of four to eight trucks. In every case, reduced costs have been a positive assurance, even before installation. Hoisting units range from 1½ to 8½ ton capacities. Bodies from 1½ to 20 cu. yd. capacities in an unlimited variety of designs for handling all types of materials from dust to liquids, including acids . . . heavy, rough or finished materials . . . or light, bulky materials. And, regardless of the different types of bodies you may need in your plant, one truck hoisting unit handles all bodies. Duplicated handling of materials is eliminated because bodies are placed at convenient points for final loading. Loaded bodies are picked up at intervals as bodies are loaded. Pick-up of bodies, placing in carrying position, dumping and replacing of empties, are all under finger-tip, hydraulic control in driver's seat.



Sizes and types of Dempster-Dumpster bodies are limited only by the requirements of a particular firm. In photos above, top left, is a few of forty 6 cu. yd. pressed steel, bottom-dumping bodies in a large plant and serviced by only two truck units. Top right, a tilt type body with large hose connections through which a finely ground material is loaded. Below left, an oval top, bottom-dumping trash and rubbish body. Below right, a body used for receiving hot furnace materials up to 1500 degrees farenheit.

Doubtless none of the bodies shown in this ad will fit your particular need, but remember there are Dempster-Dumpster bodies that will. DEMPSTER BROTHERS Inc., KNOXVILLE 17, TENN. U. S. A.

★

DEMPSTER DUMPSTER
TRADE MARK REG.

Best FOR PRECISION SOLDERING...

Best FOR EVERY SOLDER JOB!

Photo courtesy Statham Laboratories, Los Angeles

KESTER Cored SOLDERS

● Precise engineering and excellent craftsmanship—as found in Statham Pressure Transmitters and Accelerometers, the heart of which is the tiny unit being soldered in the photograph—usually means the specification of Kester Cored Solders.

● That is because Kester Cored Solders, themselves, are precision-engineered. Flux and solder are scientifically correct, the product of 47 years of laboratory research and practical field experience, exactly suited to the kind of soldering they are expected to perform. They're in proper quantity and balance, too, for best performance.

● Equipment built with Kester Cored Solders performs better, with a minimum of service difficulties, because Kester solder-bonds are permanent and hold tight under operating stresses that cause ordinary solders to give way.

● Kester engineers will gladly consult with you on the selection of the proper solder for your operation. Write fully; no obligation.

KESTER SOLDER COMPANY
4223 Wrightwood Avenue, Chicago 39, Ill.
Eastern Plant: Newark, N. J.
Canadian Plant: Brantford, Ont.

KESTER
Cored Solders
STANDARD FOR INDUSTRY

For this wheel

Use this dresser

FOR DRESSING large and coarse grinding wheels—where you want fastest possible cutting action — use Desmond Huntington dressers. Five types of handles and three sizes of cutters meet the full range of wheel dressing requirements. Bushings, spindles, washers and cutters are all carefully hardened. In every detail, these tools uphold Desmond's guarantee of complete satisfaction.

There's satisfaction, too, in knowing that Desmond makes the only complete line of grinding wheel dressers and cutters available—each item designed for proper cutting action on its particular job — to give you maximum service from your grinding wheels. Write for complete catalog and the name of your nearest jobber.

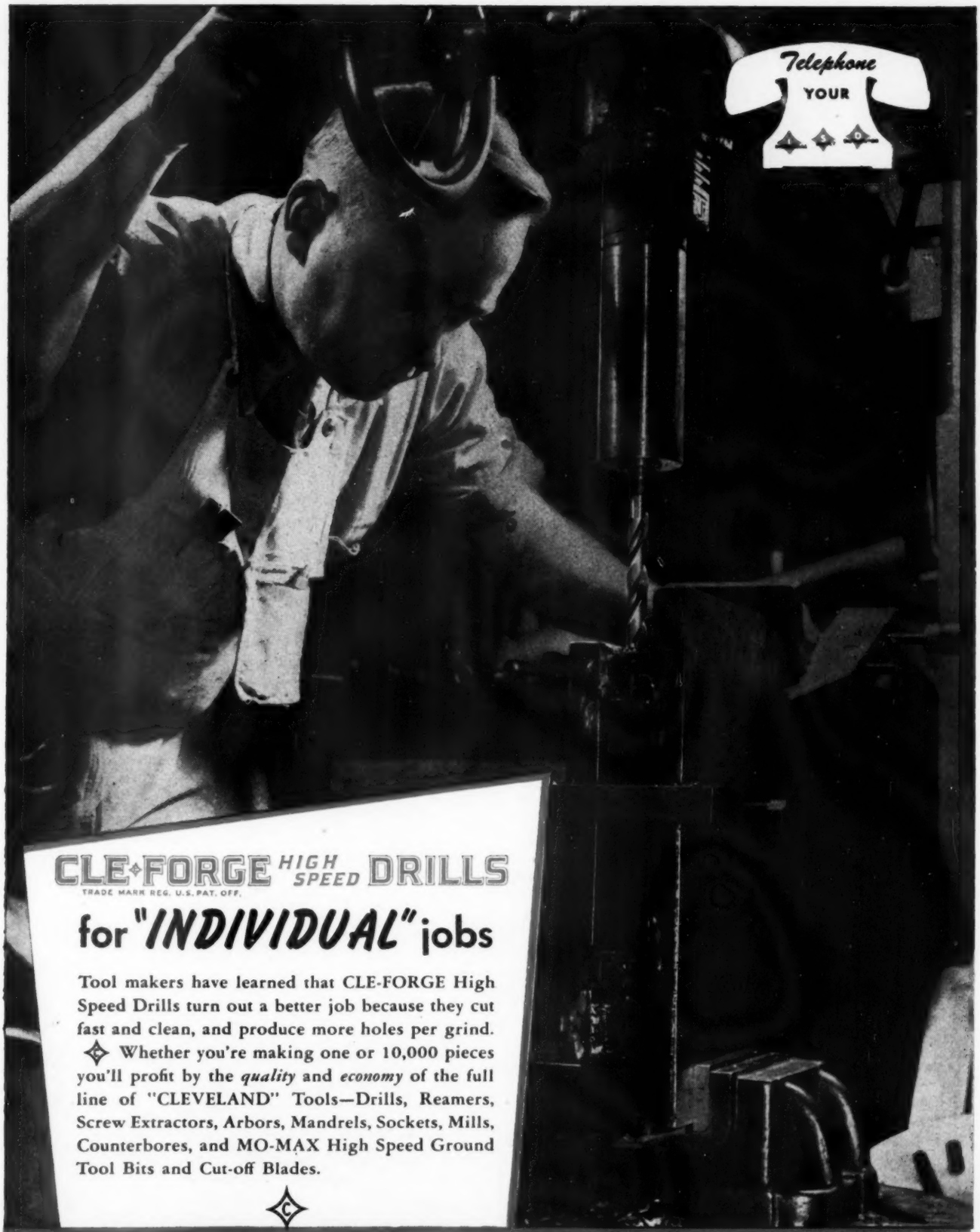
THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Desmond

the only complete line of grinding wheel

DRESSERS & CUTTERS

BALL BEARING DRESSERS | REVOLVING CUTTER TYPE DRESSERS | DIAMOND HAND TOOLS AND NIBS | WHEEL TYPE DRESSERS | SIMPLEX STEEL-SLIDE VISE



CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.

for "INDIVIDUAL" jobs

Tool makers have learned that CLE-FORGE High Speed Drills turn out a better job because they cut fast and clean, and produce more holes per grind.

Whether you're making one or 10,000 pieces you'll profit by the *quality* and *economy* of the full line of "CLEVELAND" Tools—Drills, Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores, and MO-MAX High Speed Ground Tool Bits and Cut-off Blades.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

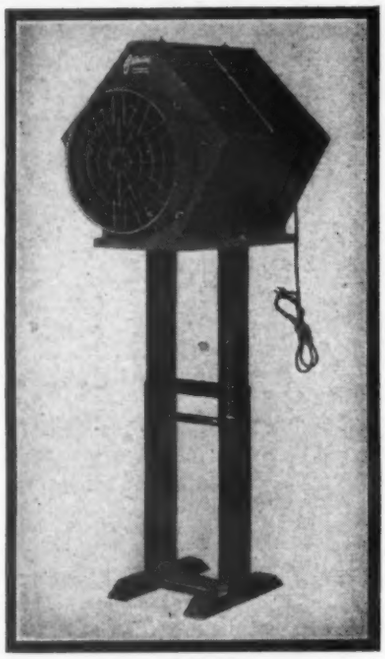
70 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 660 HOWARD ST., SAN FRANCISCO 5
2929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
B. P. BARRUS, LTD., LONDON W. 3, ENGLAND

EDWARD
Blake
COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

PORTABLE Filtaire
No. 2

TRAPS DANGEROUS FLOATING DUST



DUST—suspended in the air—circulating throughout your plant—is a real danger. It can seriously impair workers' health, cause irrevocable damage to machines and spoil thousands of dollars' worth of finished products. But, with portable Filtaire Dust Collectors placed at dust sources (grinding machines, polishers, etc.) this menace is easily disposed. The collectors are self-contained units that can be plugged into any 110 volt circuit. They take in the dust laden air, filter it through inexpensive, replaceable Dustop filters (or permanent, cleanable filters) that collect all the dirt, and recirculate the clean air into the plant.

Make sure dangerous dust doesn't circulate in your plant—use Filtaire portable dust collectors at key spots. Write for free descriptive folder.

Mail the coupon today for complete details

Please send me a free copy of Bulletin No. 444 which gives complete details on the Filtaire Portable dust collector. **A.M.**

NAME_____ TITLE_____

COMPANY_____

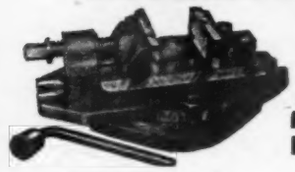
STREET_____

CITY_____ STATE_____

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS—

PRODUCTO PRODUCTO

MODERN MACHINE VISES



The *RIGHT* VISE FOR EVERY JOB IN EVERY SHOP

Every milling machine, drill press and surface grinder in every tool room or machine shop can be made to produce more work and more accurate work by using Producto Machine Vises. Hardened and ground parts that are fitted to close tolerances hold work absolutely rigid . . . saving time and money on costly rejects.

A wide variety of types and sizes is available for precision tool room work or production . . . Heavy Duty, Self-Centering, Screw Acting, Cam Lock, Quick-Lok and General Purpose Vises.

Also makers of Die Sets, Die Makers' Accessories, Hand Tapping machines and Utility Presses. Distributors of Dickerman Automatic Press Feeds.

SEE CATALOG NO. 9 FOR DETAILS.

PRODUCTO PRODUCTO

CALL

THE PRODUCTO MACHINE COMPANY
BRIDGEPORT 1, 998 HOUSATONIC AVE.

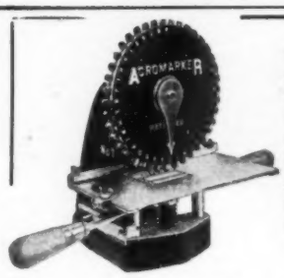
NEW YORK, 12
197 LAFAYETTE ST.

CLEVELAND, 14
5345 ST. CLAIR AVE.

INDIANAPOLIS, 2
835 FULTON ST.

DETROIT, 11
3017 MEDBURY

LOS ANGELES, 21
2100 E. OLYMPIC BOULEVARD



The ACROMARKER is a remarkably easy-to-operate marking machine offering faster, more accurate marking than heretofore possible. Widely used in industry, this model weighs only 30 lbs. It stamps letters and figures in straight or curved lines. With it unskilled help can do the work of skilled men faster and accurately.

Write for literature

The ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

CRAFTS

CARBIDE TIPPED

Consistent Quality

GAGES AND TOOLS

ARTHUR A. CRAFTS COMPANY, INC.

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT - CHICAGO

One oil solved two problems...

when we switched to Tycol dual-purpose oils

FOR CUTTING AND LUBRICATION

"Stepped up machining speed 14% . . .
Increased tool life 3 times . . .
Jumped production 25% . . .
Improved finishes . . .
Excellent machine lubricant . . ."

— is how the superintendent of a large manufacturing plant described a few of the advantages of Tycol Dual-Purpose Oil. "As a matter of fact," he said, "this oil *not only* does the work of *two* separate cutting and lubricating oils — but does it *better*"!

For complete data on Tycol "Dual-Purpose," get in touch with your nearest Tide Water Associated office today.

TYCOL
INDUSTRIAL LUBRICANTS

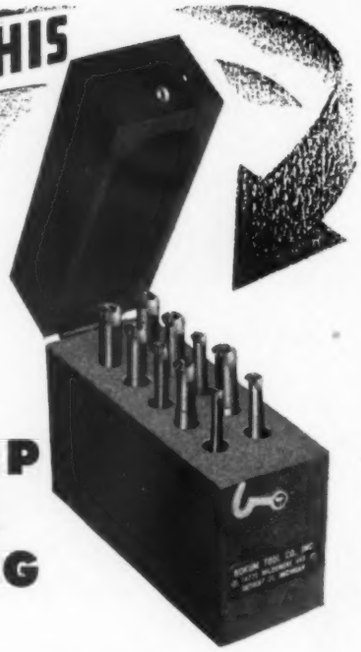
Boston • Charlotte, N. C.
Pittsburgh • Philadelphia

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

Tide Water Oil Company of Canada, Ltd. • Toronto, Montreal

LUBRICATION—"ENGINEERED TO FIT THE JOB"

SEND for THIS



TO HELP YOUR BORING

Choose an assortment of Bokum Boring Tools—of the sizes you generally use—and let us put them in this sturdy, hardwood, individual box—which we shall furnish without charge. You'll find this a most convenient way to keep these tools together—ready for instant use. The box will hold 8, 10, or 12 tools of your selection in sizes up to No. 3.

You'll prefer Bokum Tools for boring—once you use them—because the clearance angle remains constant through entire life of tool—resharpening never changes form of tool, since only one face is put to grinder—down time for regrinding reduced—finish lapped cutting surfaces produce better bores with faster speeds.

For facing and bottoming, use Style B

For internal threading, use Style C

For general boring, use Style A

Ask for catalog K-1139 for High Speed Steels —Catalog K-398 for Carbide Tipped.

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

Oil-Hole Subland Drills

Straight Shank Subland Oil Hole Drill

Morse Taper Shank Subland Oil Hole Drill

How SUBLAND OIL-HOLE DRILLS SPEED UP OPERATIONS

Two-step drilling operations with OIL-HOLE Subland Drills can be completed in much shorter time than with ordinary Subland Drills—for a reason that is very easy to understand.

Oil-Hole Subland Drills, remember, differ from ordinary subland drills in that they have oil holes that extend through the shank, and the entire length of the flutes. A constant supply of oil is thereby delivered under pressure direct to the cutting edges, making it possible to speed up the drilling operations without endangering the drill through overheating.

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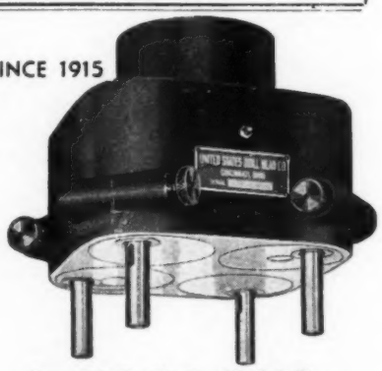

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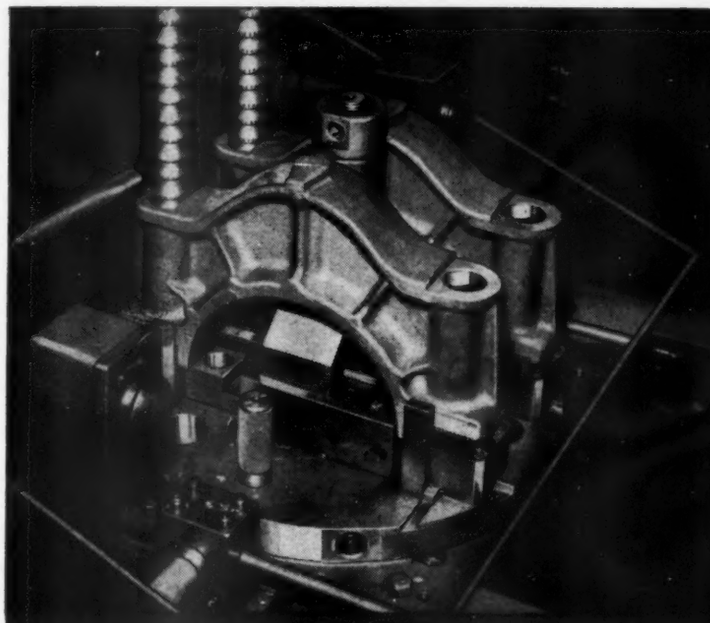
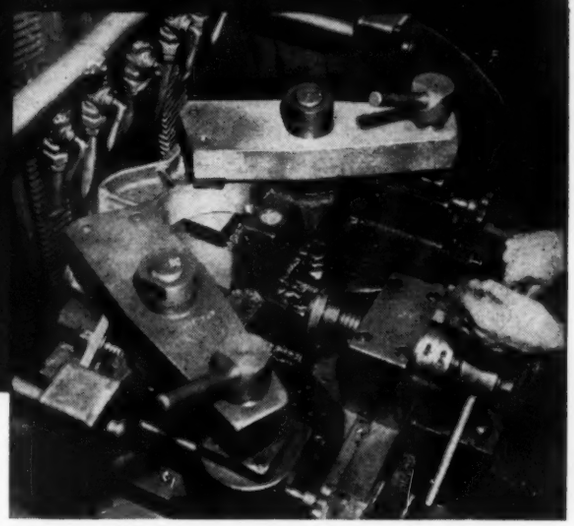


Finish broaching of four bolt holes (1-9/16" dia.) in two forged steel caps is done in less than a minute by Oilgear Vertical Pulldown Broaching . . . which proved faster and more accurate and eliminated defect-producing scratch marks.

3/16" of stock broached from two bolt bosses simultaneously on Oilgear Vertical Broaching machine which also broaches 1⅛" stock from two lock-fit and joint-face surfaces measuring 2¾ x 2¾".



In removing metal and finishing surfaces such as these

. . . Oilgear broaching reduced operations and saved $3872.00 a month

How much can Oilgear Save for YOU?

The parts pictured in the two photographs shown above are main bearing cap forgings used in a well-known Diesel engine. Formerly, these forgings had to be milled . . . planed . . . hand-scraped . . . drilled . . . reamed . . . and bored before they were ready for assembly. Now, with Oilgear Broaching, the task is much simpler. Two bolt bosses, two bolt holes, lock-fits and joint-faces are rough and finished broached. That is all.

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The time has come for every industrial executive again to take costs seriously. The time has come for every industrial executive to investigate Oilgear Fluid Power Broaching for the tremendous impact it can have on costs of every sort. Get the facts *NOW*. THE OILGEAR COMPANY, 1313 W. Bruce St., Milwaukee 4, Wisconsin.

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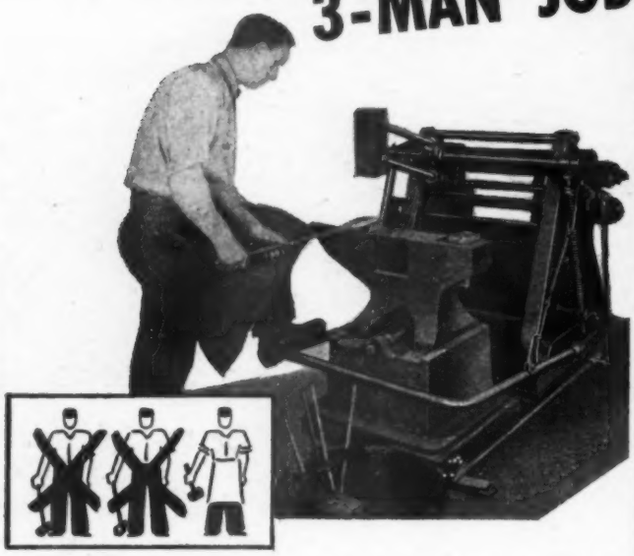

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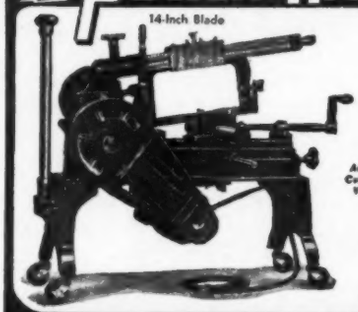

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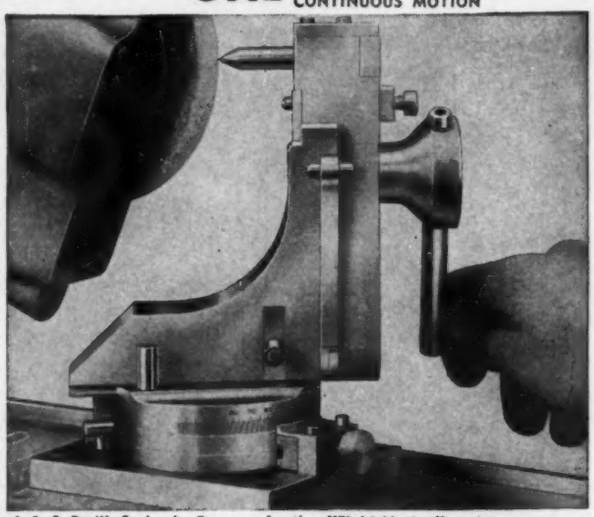

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5/32"	12	9	1.50	23/64"	12	9	2.50
11/64"	12	9	1.50	3/8"	12	9	2.50
3/16"	12	9	1.50	25/64"	12	9	2.75
13/64"	12	9	1.60	13/32"	12	9	2.75
7/32"	12	9	1.60	27/64"	12	9	3.00
15/64"	12	9	1.75	7/16"	12	9	3.00
1/4"	12	9	1.75	29/64"	12	9	3.25
17/64"	12	9	1.85	15/32"	12	9	3.25
9/32"	12	9	1.85	31/64"	12	9	3.25
19/64"	12	9	2.00	1/2"	12	9	3.25
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9/16"	15	12	7.00	7/8"	15	12	12.00
19/32"	15	12	7.50	29/32"	15	12	12.50
5/8"	15	12	8.00	15/16"	15	12	13.00
21/32"	15	12	8.00	31/32"	15	12	14.00
11/16"	15	12	8.25	1"	20	15	16.00
23/32"	15	12	8.50	1-1/16"	20	15	17.00
3/4"	15	12	8.50	1 1/8"	20	15	18.00
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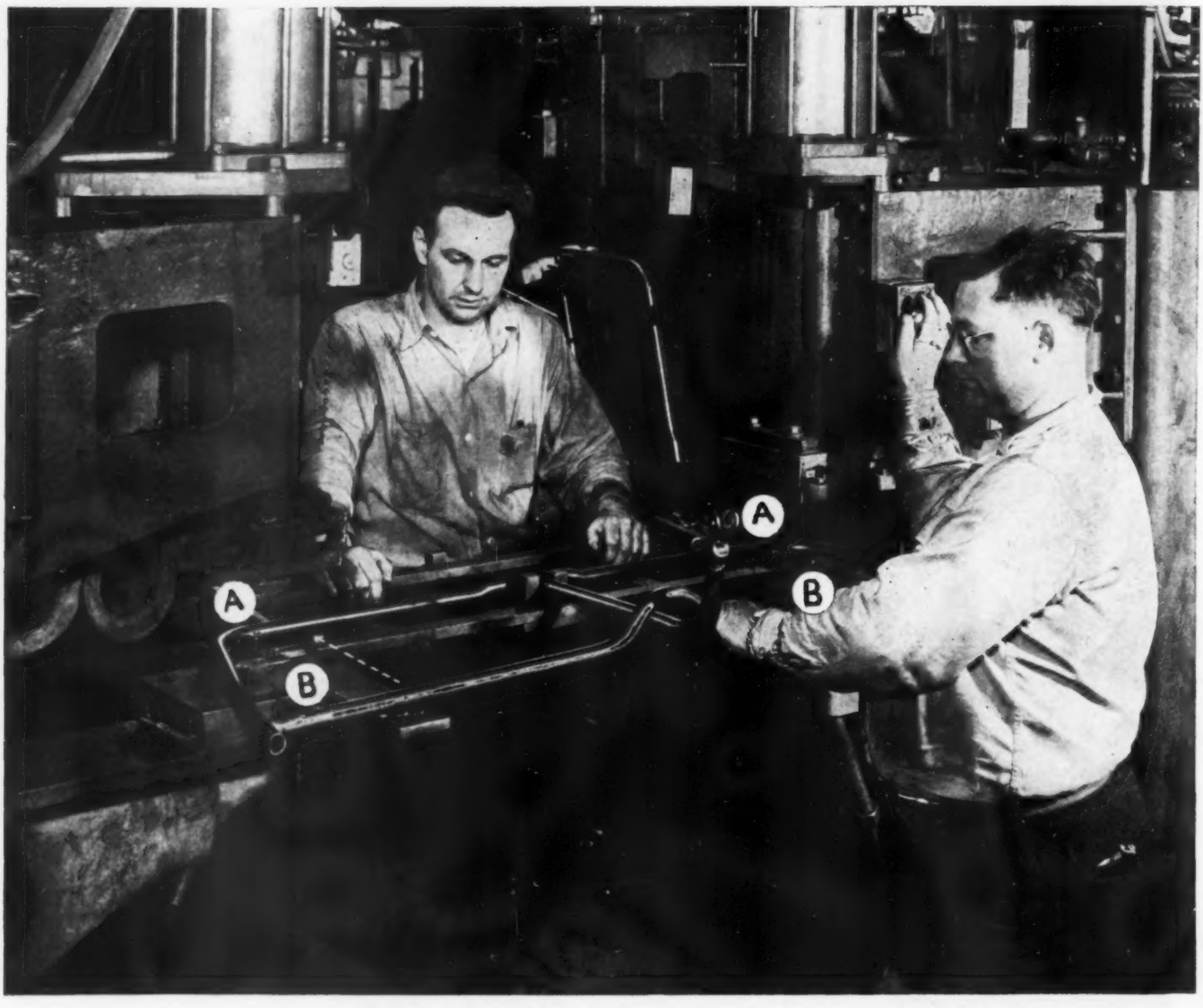

* *These are projection welds, four projections being stamped into each bracket. Thus eight welds (two complete brackets) are made during each cycle of this combination unit.*

Bulletin 4520 describes Federal Press Type Welders. Bulletin SP-346 describes all types of Federal welders.

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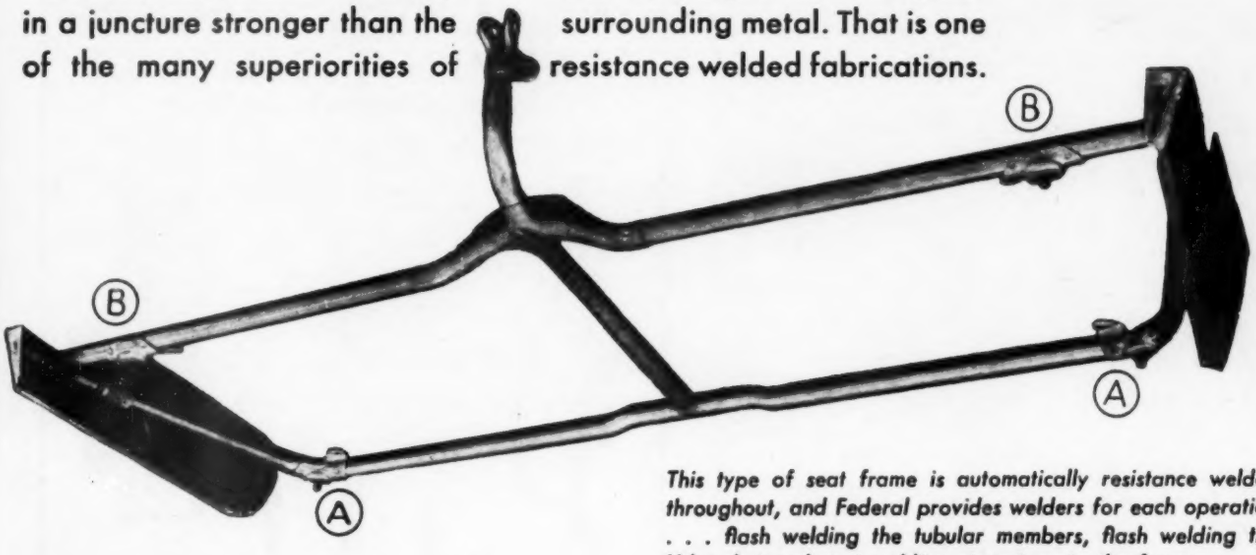
Hourly on Federal RESISTANCE WELDERS

THE FEDERAL Resistance Welding pictured here happens to be the assembling of studded brackets to a sliding seat frame, but the principle involved may well apply to some production of yours... the principle of getting the best possible juncture between two or more pieces of metal at the lowest possible cost.

In this case two Federal PA-2 press type welders are used as one projection welding unit. They are mounted on a single steel base for solid alignment, and synchronized with electronic controls to operate in unison. The dies are simple. Air-lift cylinders provide extra wide die opening for easy loading.

Brackets are dropped in each of the lower dies (A-A and B-B). The frame is then quickly positioned in dies A-A (no locking necessary). Seconds later, two brackets having become a part of the frame, the work is indexed in the direction of the dotted line and two more brackets welded (in dies B-B). Job is done in less than 30 seconds floor to floor, delivering 150 frames (600 brackets with 2400 welds) per hour.

These brackets are not merely "fastened" to the frame. They are a part of it, because resistance welding literally forges the two parts in a juncture stronger than the surrounding metal. That is one of the many superiorities of resistance welded fabrications.



This type of seat frame is automatically resistance welded throughout, and Federal provides welders for each operation . . . flash welding the tubular members, flash welding the Y-bracket and spot welding stampings to the frame.

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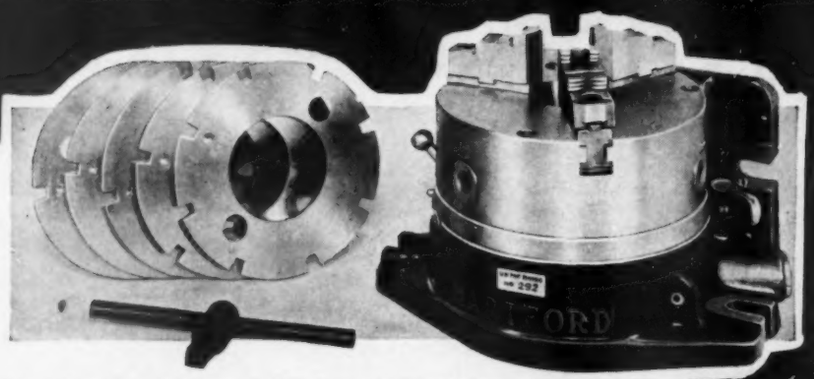

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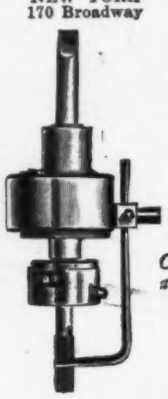
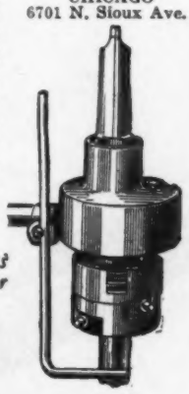


Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" ⅛"
" 0	⅛" ⅛"
" 1	⅛" ¾"
" 2	⅜" 1 "
" 3	⅝" 1¼"
" 4	¾" 1½"
" 5	¾" 2 "



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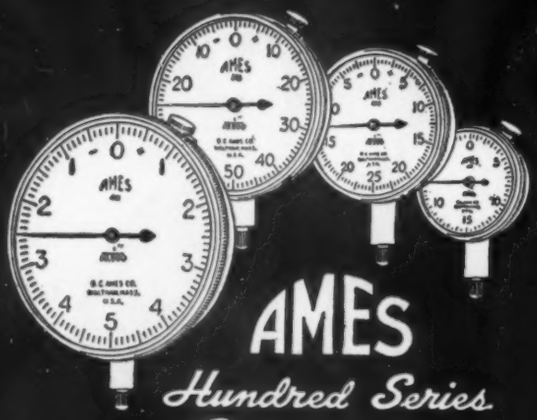

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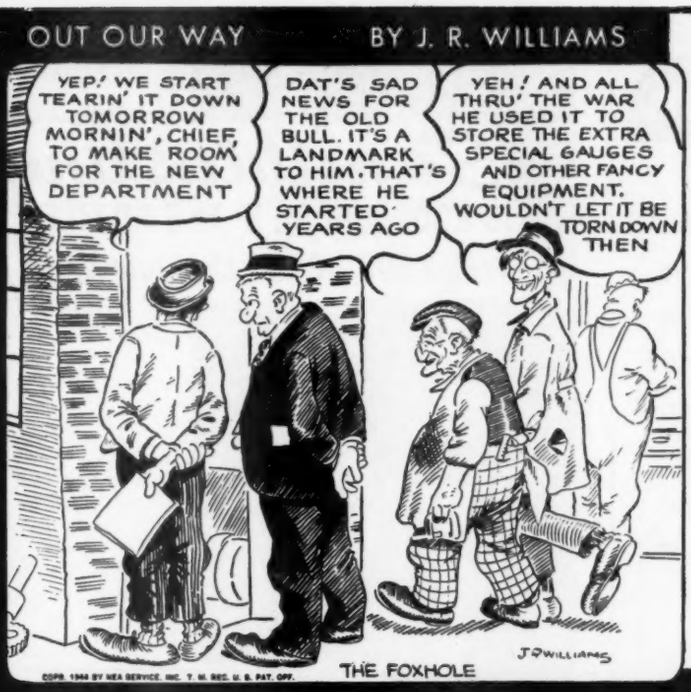
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YEH! AND ALL THRU' THE WAR HE USED IT TO STORE THE EXTRA SPECIAL GAUGES AND OTHER FANCY EQUIPMENT. WOULDN'T LET IT BE TORN DOWN THEN
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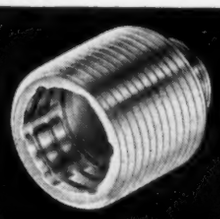

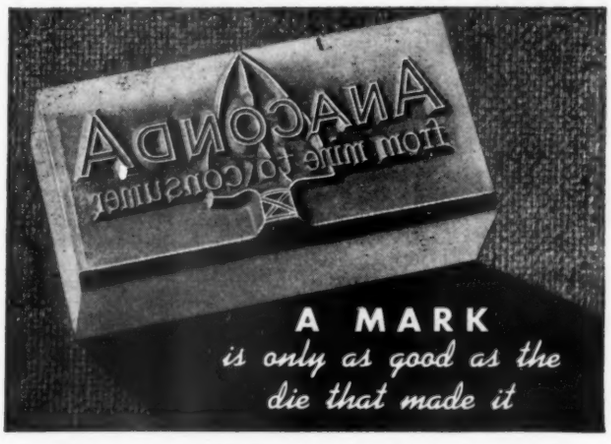

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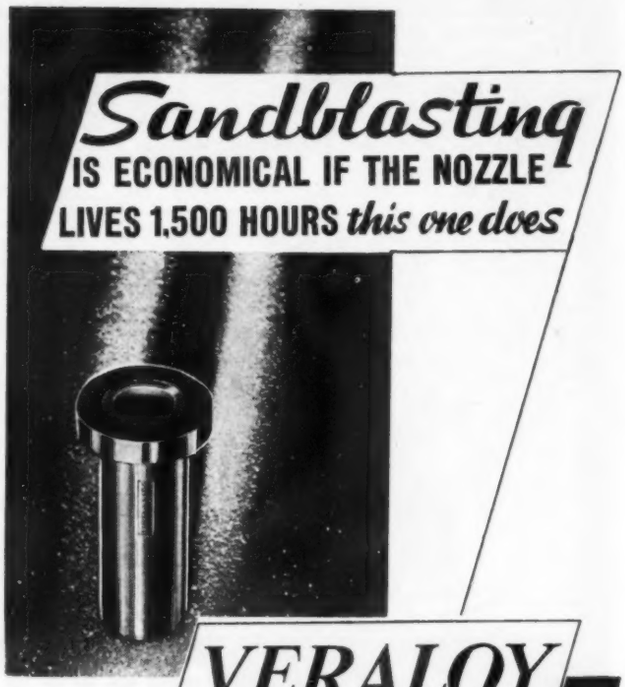

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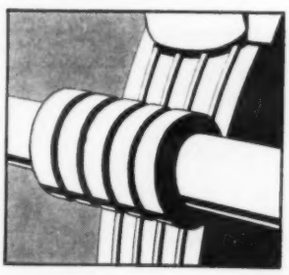

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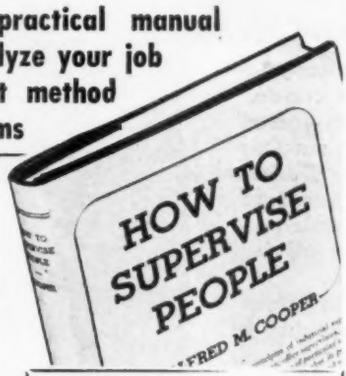

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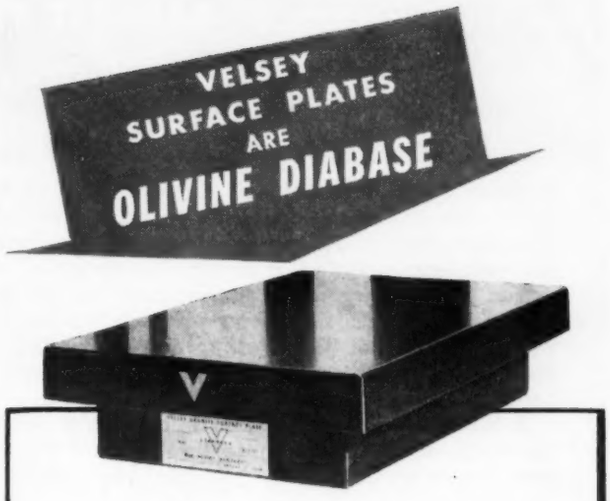

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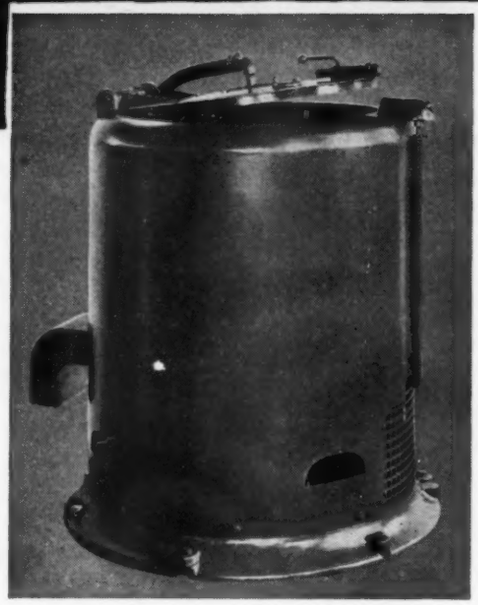

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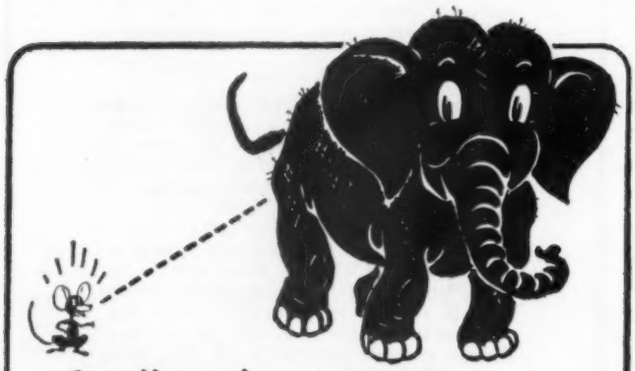

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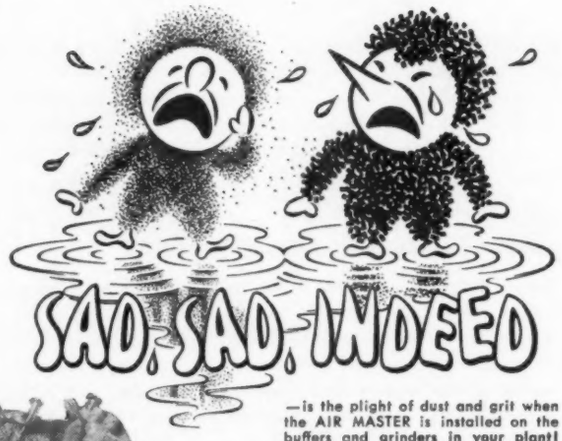

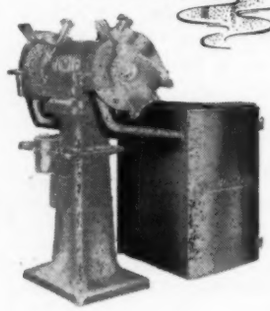

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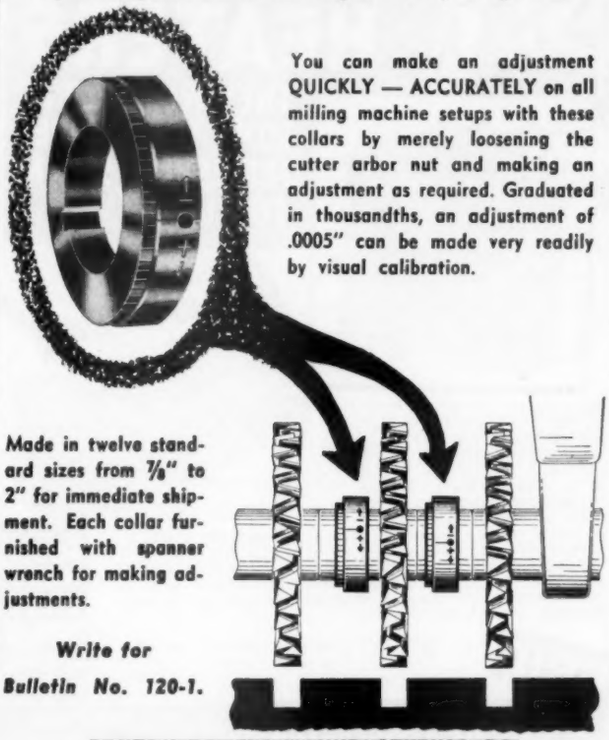

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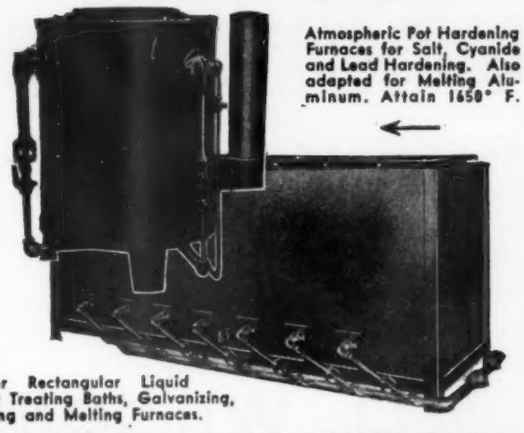

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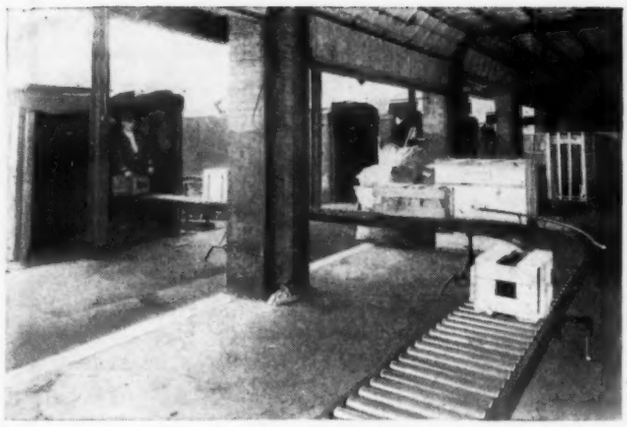

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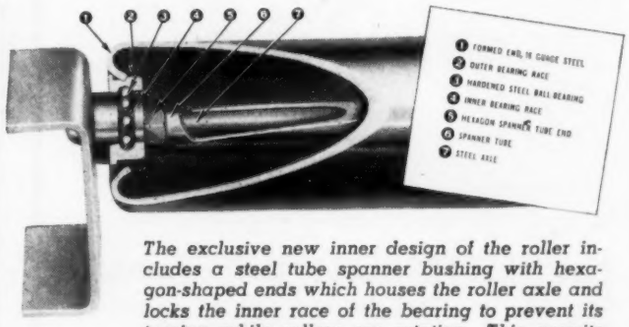
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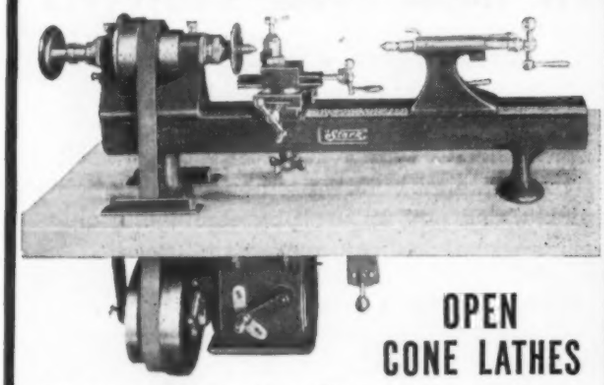

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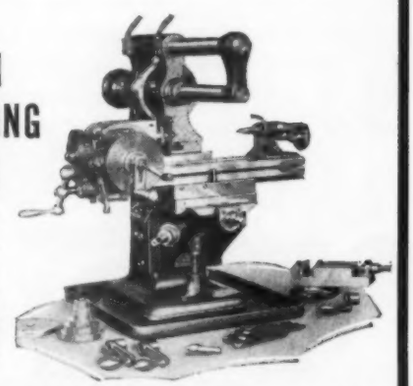

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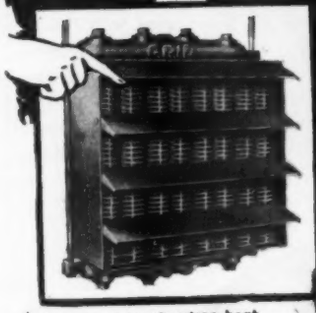

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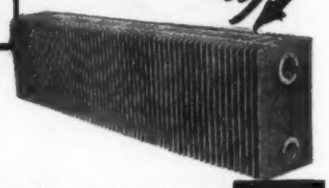

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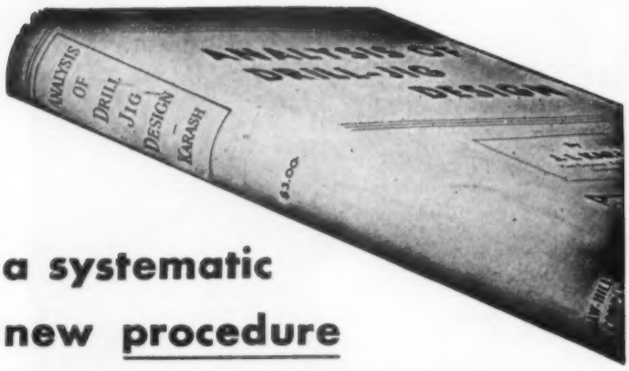

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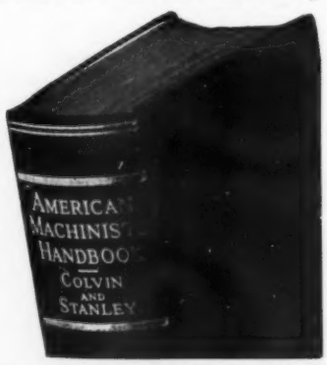

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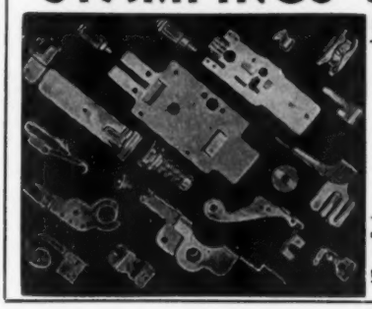

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Must have intensive experience in the designing and production of screw pumps. Write names and addresse of all former employer; age; salary desired.

P-611, American Machinist
330 W. 42nd St., New York 18, N. Y.

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LOCK JOINT PIPE CO.
BOX 269, EAST ORANGE, N. J.

WANTED

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Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-581, American Machinist
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A leading, long established Eastern manufacturer of automatic power presses and allied sheet metal equipment has opening for engineer with broad experience on sheet metal fabrication for position of Assistant Sales Manager. Position involves inside work principally with only limited amount of traveling. Give complete information in first letter including age, full record of experience, education, references and salary desired. Address

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Old established machinery manufacturer located within sixty miles of New York requires shop superintendent for modern machine and assembly plant with about 250 employees.

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P-728, AMERICAN MACHINIST
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DIE AND TOOL SHOP—$6,000 plus bonus. To take complete charge of rapidly growing die and tool shop in Pittsburgh area. Must be experienced in estimating jobs and supervising manufacture of the following dies: Die casting, plastic, permanent mold, forging, sheet metal blanking, and forming. Experience in manufacture of special cutting tools desirable but not necessary. Employer will pay placement fee.

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Club Floor Suite
Hotel William Penn. Pittsburgh, Pa.

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EXPERIENCED FIXTURE Designer wanted. Good opportunity for high grade man. Give full particulars as to experience and salary desired. Application will be treated as strictly confidential. Consolidated Machine Tool Corporation, Rochester, N. Y.

WE HAVE an opening for a first class practical machine tool designer. This is a good opportunity for a man who has had wide experience. Give age, experience and salary expected. P-738, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED—MECHANICAL Engineer for procedures work in planning, estimating and routing. Must know machines and machine operations. Plant of approximately 300 employees producing specialized tailor-made products. Located in Wisconsin's Fox River Valley. P-737, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: DESIGNER experienced on small and medium automatic machinery. Familiarity with punch press tools, feeds and attachments. To arrange for interview write, giving pertinent data, to V & O Press Co., Inc., Hudson, N. Y. Att: Chief Engineer.

WANTED: TOOL and Methods Engineer for permanent position to supervise the design, manufacture, handling and upkeep of tools for small precision parts. Must be familiar with latest high speed automatic machine tooling, toolroom practice, gauges and records therefor and how to integrate tooling program with production planning procedures. Must be energetic, alert, co-operative and cost-minded. Give age and past record in detail, indicating salary desired. P-733, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED—CHIEF Inspector: Man capable of organizing and controlling inspection and procedure of staff of 15 men. Must be experienced in manufacture of precision machines and parts of medium size. Should have tool room and some engineering background, capable of personal inspection of intricate and precise parts of highest accuracy. Production experience and managerial ability desirable. Plant located in New York State. Excellent opportunity. State salary requirements. P-732, American Machinist, 330 W. 42nd St., New York 18, N. Y. 15th St., N. W., Washington 5, D. C.

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SALESMAN: SALARY and commission. New machine tool with wide application for production and maintenance. Require knowledge of metal working and experience selling specialties. A real opportunity and permanent position for salesman to develop exclusive territory in New York City and vicinity. Prefer under 35 years of age, with good education. Please send complete resume of experience with reply to SW-723, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 287)

Additional Employment Advertising on Page 287

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AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅝" 4-spindle Automatics, complete
2—3¾" Cleveland Model A.
1—#2 Brown & Sharpe High Speed with Turner Drive.
1—#2G Brown & Sharpe Full Automatic, serial #5396.

LATHES

14" x 12' Hendey Toolmakers, motor drive.
14" x 20' Hendey Toolmakers Lathe.
16" x 6' Rockford Toolroom Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' Lodge & Shipley 12-speed Grd. Hd.
18" x 10' American, Geared Head, Taper.
20" x 10' Hendey with Taper.
20" x 10' American, Motorized. Q.C.G.
24" x 20' American, Motor drive.
48" x 30' Simmons Geared Head, 1941.
14" x 6' Hendey Tool Makers, taper.

TURRET LATHES

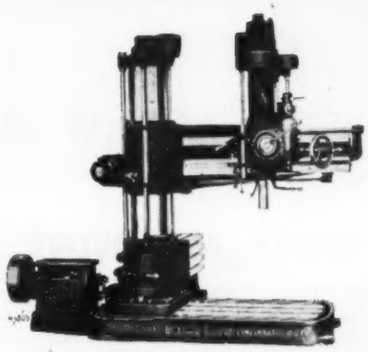
4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Foster GFH Hand Turret Lathe.
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Pels Hand Operated Universal Iron Worker capacity 2" x 2" x 3/16 angle; 1" round bar stock, punch ½" hole thru ½" plate. Armor plate construction.....$350.00

PLANERS

20" x 20" x 24" N.-B.-P., Planer Shaper.
26" x 26" x 8' Gray Planer, 2 heads.

SHEARS & METAL WORKING

Lennox Splitting Shear ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Gould & Eberhardt Slitting Shear, 10 ga.
Bertsch 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
Niagara 36" Power Folder, 20 Gage.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Thread Miller, Hall Planetary #1—24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#2½ LeBlond Universal.
#3B Hendey Universal Miller, motor drive.
#4 Cincinnati Vertical High Power Miller. (2)

#16 Blanchard Surface Grinder, 30" dia., magnetic chuck, 25 h.p. motor on spindle.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter.

RADIAL DRILLS

5' Arm, 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.
6' Arm, 15" Column Cincinnati-Bickford.
3½', 10" Col., Cincinnati-Bickford AC Motor Drive, Gear Box.

GRINDERS

1—#3 LeBlond Tool and Cutter, Motor Drive.
1—#11 B & S Plain Cylindrical, S.P.D.
#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump 15" swing, 5" hole, 4" deep.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.
2—Cincinnati, #1½ Tool & Cutter Grinders.
10" x 84" Norton Model A Cylindrical.

BORING MILLS

72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed 24" x 36", 4-post.
75 ton H.P.M. 2 post, Hydraulic Press.
1—Zeh-Hanneman, #16, Percussion Press, 250 ton capacity.
Hilles & Jones #5 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 54" throat.

SHAPERS & GEAR CUTTERS

#1 Adams Gear Hobbers, Belt driven (3).
21" Smith & Mills B.G. Helical Gears.
15" Potter & Johnson, Universal Knee.
16" Gould & Eberhardt, Direct Motor drive.
Slotter 12" stroke New Haven, motor drive.
Rhodes 7" stroke, Shaper.

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Thomson Cutter and Creaser, 12½ x 18½.
Heat Treating Furnaces for the tool room.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½. New this year.
Schuster Wire Straightener & Cut Off, capacity ½" dia. up to 40' long.

120" x 96" x 24' **Simmons Heavy Duty Double Housing Planer.** Complete with 4 heads and standard equipment, arranged for reversing motor drive and rapid traverse and including one Reliance 50 HP, 150/900 RPM D.C. motor, frame P-4617, 230 volts serial #644739, one Cutler Hammer control Box #B-871007A7.

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BROWN & SHARPE No. 2B, No. 4B standard type—Timken Bearing—latest type
CINCINNATI #2 Timken Bearing—Dial Type—latest type
KEARNEY & TRECKER No. 2H, No. 2 HL, No. 3H, Timken Bearing—latest type
KEARNEY & TRECKER No. 2K, No. 3K—Timken Bearing—latest type
KEARNEY & TRECKER #2A—motor drive

● MILLING MACHINES—Universal

BROWN & SHARPE #3A single overarm—motor drive
CINCINNATI #2—Timken Bearing—Dial Type—latest type
ROCKFORD #2B—motorized
VAN NORMAN #26 Ram, latest type

● MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI No. 2, No. 4, Timken bearing—dial type, latest type
KEARNEY & TRECKER No. 2H, No. 3K—Timken Bearing—latest type
REED PRENTICE No. 3VG—high speed—latest type
GORTON No. 8D Hi speed—latest type

● MILLING MACHINES—Manufacturing

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CINCINNATI 45 x 48 Hydro, Timken Bearing—latest type
CINCINNATI 4-36 Hydro. Timken Bearing—latest type
CINCINNATI #0—8 Vert. Pl. Auto.—Timken Bearing—latest type Rise & Fall
CINCINNATI No. 1-12, No. 1-18 Plain Automatic Timken Bearing—latest type
INGERSOLL 24 x 24 x 8' Planer type—1 head
INGERSOLL 36 x 48 x 18' Planer type—4 heads
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KEARNEY & TRECKER No. 1218 Auto. Timken Bearing—latest type
KENT OWENS No. 2 RV Hand Miller—Timken Bearing—latest type
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OHIO Auto. 16" x 72" table—Timken Bearing—latest type 36" longitudinal feed
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PRATT & WHITNEY 6 x 120, 6 x 132—M.D.
MOREY SHIELDS 12 x 30, 12 x 60, 12 x 120, 12 x 192—latest type

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LAMAIRE 18" Vertical Hyd., latest type
MOREY 10", 14", Vertical—latest type
PRATT & WHITNEY 6", 10"—Vertical—motor drive
PRATT & WHITNEY 6", 12" Model B—latest type

● GRINDERS—Surface

ARTER 8" Rotary Surface
ARTER 30" Rotary Surface—Hyd., latest
ARTER Automatic Piston Ring
BLANCHARD #16A Dial Type, M.D.
BLANCHARD #16—26" Chuck—motor drive
GALLMEYER & LIVINGSTON No. 35 8" x 24"—Hydraulic—latest type
MATTISON 12 x 14 x 48'—Hyd.—latest type
MATTISON 16 x 24 x 96—Hyd.—latest type
NORTON 10 x 60—Hydraulic—latest type
NORTON 6 x 18 Vert., Hyd., latest type
THOMPSON 12" x 12" x 24" Type B Hydraulic—latest type
THOMPSON 12" x 16" x 48" Type C Hydraulic—latest type

● GRINDERS—Cylindrical Plain and universal

BROWN & SHARPE No. 3, No. 4 Univ. M.D.—latest type
NORTON 24 x 240 Plain—motor drive

● GRINDERS—Internal, Cutter and Miscellaneous

BRYANT No. 16—16" Chuck Internal
BROWN & SHARPE No. 13 Univ. & Tool—latest type
CINCINNATI No. 2 Plain Tool & Cutter—latest type
CINCINNATI #2, Centerless, motor driven
HEALD No. 70—Internal—motor drive
HEALD #72 A3, sizematic internal, latest type
HEALD No. 81 Plain Internal—latest type
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PRATT & WHITNEY Contour Cutter—latest type
OLIVER Univ. and Tool—latest type
UNIVERSAL Spline shaft; Hydraulic

● BORING MILLS—Horizontal

CINCINNATI-PILBERT 3½" bar; floor type latest type
FRANKLIN 4½" bar—SPD
LUCAS No. 31—3" Bar—motor drive
NILES BEMENT POND 5½" Bar
NILES BEMENT POND 4½" bar—floor type
NILES BEMENT POND 5" bar—floor type
NILES BEMENT POND 7" bar—floor type
NILES BEMENT POND 4½" bar—Duplex floor type
NILES BEMENT POND 6" bar—floor type
P & H #10—3½" bar floor type

● BORING MILLS—Vertical

BETTS 120"—2-swivel heads, motor drive
BULLARD 24", 36", 42" New Era Type—motor drive
BULLARD 54" Spiral Drive; latest type
BULLARD 86"—2-swivel heads; motor drive
COLBURN 72" 2-swivel heads AC motor driven
KING 72" 3 heads, latest type, AC motor driven
KING 62" 2-swivel heads AC motor driven, PRT
NILES 73" 2-swivel heads PRT, AC motor driven, late type
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AVEY No. 2—1 to 6 spindles
BAKER #121 Single spindle—latest type
BODINE No. 42-20 Auto.
BUFFALO #16—4 spindle—latest type
FOOTEBURTE SIPP #2, #3—single spindle—latest type
HENRY & WRIGHT—2-spindle

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CAN GIVE YOU IMMEDIATE DELIVERY ON YOUR MODERN PRODUCTION NEEDS

NATCO C-13H multiple spindle
PRATT & WHITNEY No. ½B x 50"—2-spindle deep hole—latest type

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AMERICAN 5' 13" Universal—M.D.
AMERICAN 5' 13" triple purpose, motor driven
CARLTON 3' 11"—latest type
CARLTON 4' 13", M.D.
WESTERN 4' 18", 5' 18", 6' 20"—latest type

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BARBER COLMAN No. 3 Gear Hobber
BARBER COLMAN Type A Gear Hobber
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BROWN & SHARPE No. 6 x 60 Gear Cutter
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FELLOWS No. 624A Gear Shaper, latest type
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GLEASON 24" Bevel Gear Planer
G & E 12H Gear Hobber Motor drive
GOULD & EBERHARDT 18G Gear Hobber, motor driven
G & E #36B Gear Cutter; spur—Bevel—m.d.
G & E #96H Gear Hobber, with differential
MICHIGAN #854 Gear Finisher, latest type

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BARDONS & OLIVER #5, #7 Univ. Timken Bearing; chucking
CINCINNATI ACME #1 Universal—Timken Bearing—latest type
CINCINNATI-ACME 5W, Timken Bearing, latest type, 2" bar cap
GISHOLT No. 2L Univ. Timken Bearing —latest type
GISHOLT No. 3, No. 4 Univ. Timken Bearing —latest type
GISHOLT #3D Simplimatics—Timken Bearing—latest type
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing, latest type
JONES & LAMSON #3-#5-#7C Univ.; latest type—Timken Bearing
LIBBY #1H—5 Timken Bearing—latest type —5½" hole
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LEBLOND 14 x 54" centers, Timken Bearing, latest type
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LEBLOND 20" x 48—20" x 120 centers—Timken Bearing—latest type rapid production
LO SWING 4x84, 4x60, 8x84, 8x60 Timken Bearing—latest type
NILES 36" x 25' centers, 2 carriages, PRT; Timken Bearing
NILES 36" x 120" centers—Timken Bearing —latest type
PITTSBURGH 50" x 30' bed—M.D.
REED PRENTICE 14 x 30 Timken Bearing—latest type
RIVETT Style 918 Bench Type; ball bearing; motor driven
SEBASTIAN 20" x 8' bed; Timken Bearing; latest type

● PLANERS

CINCINNATI 24" Crank—motor drive
CINCINNATI 36 x 30 x 5' Box table, PRT, 1 head—motor drive
CINCINNATI 120 x 96 x 20'—4 heads box Table, PRT—motor drive
CLEVELAND 48 x 48 x 16' Open side, 3 heads, motor drive
DIETRICH & HARVEY 48 x 48 x 16' 4 heads, Hydraulic—motor drive
GRAY 48 x 48 x 16' 4 heads motor drive
HAMILTON 42 x 42 x 20', 4 heads, motor drive
LIBERTY 24 x 24 x 8'—Vari-voltage, latest type
LYND FARQUHAR 26" open side M.D.
NILES BEMENT POND 96 x 80 x 20' box table 4-heads Hyd. PRT. motor drive

● AUTOMATIC SCREW MACHINES

CLEVELAND ⅞" to 2½" Model A
CONOMATIC 3½"—4 spindle—latest type
NEW BRITAIN-GRIDLEY No. 65; 6 spdle; chucking; latest type

● PRESSES

CLEARING TYPE K-1200-30 Knuckle Joint, 200 Tons—latest type
BALDWIN SOUTHWARK 300 ton Vertical Hydraulic. Latest type
FERRACUTE DG-55, drawing; latest type
WATSON STILLMAN Hyd. Straightening Press 20 Ton

● SAWS

PEERLESS 6 x 6 Hack Saw—Auto. Feed—latest type
MARVEL #9A Hack—Auto. Feed—latest type
PEERLESS 14" x 14" Hack—latest type
RACINE 10 x 13 Hack—latest type
CAMPBELL #401 Cutamatic Wet Abrasive Cutting Machine
MOTCH & MERRYWEATHER #3 Cold Saw—Hyd. latest ype
LUCAS #138 Cold Saw

● MISCELLANEOUS

AMERICAN V2-6 Vert. Broach—latest type
MITTS & MERRILL #5 Keyseater
LE BLOND #2 Horiz. Hone—SS Latest type
BARNES #2 Hone SS Latest type
LE BLOND #2 Deep Hole Borer—Timken Bearing—latest type
NILES 30 x 50' Deep Hole Borer Timken Bearing—latest type
MORTON 60" combination Traveling Head Planer—Milling & Drilling
BRINNELL Auto. Direct Reading Hardness Testing Machine
RHENBERG JACOBSEN Centering Machine
PRATT & WHITNEY #3B Jig Borer
YODER Multi. Tube Cutting Machine
DE LAVAL Oil Clarifier
CLEVELAND Hob Relieving Machine

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REBUILDERS OF MACHINE TOOLS

QUALITY *Machine Tools*
NOW IN STOCK

5 Model RA-6 Acme-Gridley 1" Six Spindle Automatic Screw Machines, motor driven, with full set collets, threading spindles, drill speeders, high speed reaming attachments and bar feed. New in 1941.

Model 1A Warner & Swasey Turret Lathe, motor driven, with complete bar feed, collet chuck and master collet. New in 1942.

AUTOMATICS
5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
1" x 5" New Britain, six spindle.
⅞" Cleveland Model M, four spindle.
No. 00, 0, 2G Brown & Sharpe.

BROACHES
Lapointe CPC 24 Hydraulic Vertical.

DRILLS
★ **6 ft. American Radial, enclosed head.**
5 ft. Carlton Radial, enclosed head.
21" Buffalo Stationary Head.
No. D2 Colburn, single spindle.
42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".**

GEAR CUTTERS
No. 7 Fellows Gear Shaper, m.d.
No. 6, 61 Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
6" Gleason Str. Bevel Gear Generator.

GRINDERS
36" x 168" Mattison Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
Nos. 16—26", 16—30" Blanchard Surface.
No. 72A3 Heald Gagematic Int. Grinder.
No. 70 and 75 Heald Internal Grinders.
No. 13 Brown & Sharpe Universal & Tool Grinder.
★ **12" x 36" Cinci. Hydraulic Universal, with internal attachment, m.d. New 1942.**
10" x 72" Norton Cylindrical Grinder.
No. 2 Cincinnati Centerless Grinder.
★ **No. 3 Cincinnati Centerless, m.d.**

LATHES, ENGINE
10" x 20" Monarch Type EE. Precision.
12" x 6' Monarch, g.h., Type KK.
16" x 6' Reed Prentice, g.h., Type AA.
16" x 8' American, g.h.
18" x 10' Hendey, g.h.
24" x 10' American, C.D.
24" x 30' Lodge & Shipley, g.h.
48" x 12' Lodge & Shipley, C.D.
IMP and LR Lo-Swing Lathes, m.d.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET
No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bear.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

MILLS
No. 31 Lucas Horizontal Boring Mill.
No. 4A Brown & Sharpe Universal, s.p.d.
No. 4 Cinci. Universal, rect. overarm.
No. 3B Milwaukee, plain, m.d.
No. 2 M.H. Cincinnati Plain, m.d.
No. 2H Milwaukee Vert., motor in base.
No. 0-8 Cincinnati Plain Automatic, m.d.
★ **18" Cincinnati Plain, m.d., new 1943.**
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.
No. 2 Milwaukee Universal.
4" Pratt & Whitney Spline Mill.
42" Bullard Vertical Boring Mill.

MISCELLANEOUS
2500 Ton Lake Erie Forming Press.
Reliance Sand Blast No. 193A.
No. 100 Micromatic Hydrohoner.
Schraner Crankshaft Lap. Mach., Mod. B.
8" x 7" Troy Vertical Steam Engine.
No. 72 Etna Rotary Swaging Machine.
Gray Nibbler, ¾" capacity.
Barrett Oil Separator.

PLANERS AND SHAPERS
24" American Crank Shaper, c.d.
★ **6" Pratt & Whitney Vertical Shaper.**
38" x 38" x 14' Ohio Planer.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. motor drive.

SAWS
9" x 9" Peerless, Hydraulic.

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MACHINERY & SUPPLY CO., INC.
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MEXICO OFFICE: *Avenida Independencia No. 36B, MEXICO, D. F.*

PUNCH PRESSES

IMMEDIATE DELIVERY FROM STOCK

No. 4½ BLISS, 80-100 Ton Capacity straight side punch press, late model with scrap cutters, double roll feeds, bolster. 15 Hp motors and controls, forced feed lubrication. 21x27 bolster, 4½" stroke, 14½" shut height. In both Single and Double Action Models. Like new, no welds or no cracks. (15 available for immediate delivery.)

No. 6 BLISS, 90-125 Ton Capacity, straight side Punch Presses, late model. With scrap cutters, roll double roll feeds, bolster, 15 Hp motors and controls, forced feed lubrication. 25x30" bolster, 5½" stroke, 16½" shut height. In both Single and Double action models. Like new. This machine is exactly like the above—only slightly larger model.

18—75 ton straight side punch presses non-adjustable strokes, late model, motorized.

SPOT WELDERS IMMEDIATE DELIVERY 5-100 KVA, Brand new. 5 year guarantee.

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Slightly used. NF-2 & 3, ¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
LESS 75 Percent Discount.
ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
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Blueprint machines, printer-washer-dryer
Rivett Ball Brg. Precision Screw-Machine
Simmons No. 1A Micro Milling Machine
Drills, high speed single & multiple spindle
Drill, 21" Royersford Bk. Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindle
Drill, #25 Foot-Burt, motor driven
Drills—New—18" Royal Motor driven (10)
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks, #1-2 & 3 and Collets
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ¼" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot In Stock—New

Outfit: about 27 fine machine tools, drills, lathes, and 5 milling machines, plain and Uni. Tell us definitely what you want as our list is incomplete and only partial.

The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

LATEST MODELS

1—3'-9" Column Cinc. Bickford Radial.
1—3'-11" Column Morris Radial.
1—3'-11" Column American Radial.
2—72" King Vertical Boring Mills.
2—36" x 84" Centers American Lathe.
1—4" Bar Universal Horizontal Boring Mill.
1—2H Kearney & Trecker Vertical Miller.
1—#3 Cincinnati Vertical Miller inbuilt Rotary Table.
1—72" LaPointe Broach Shaper.

Wigglesworth Machinery Co.
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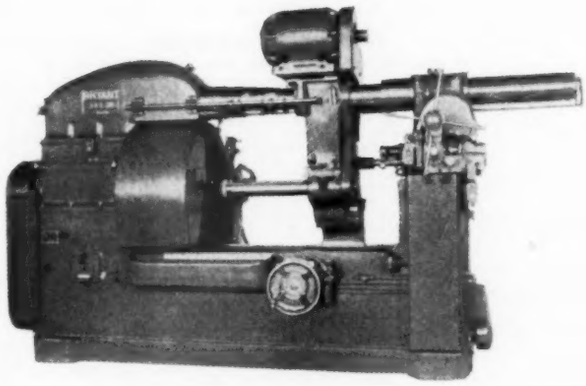
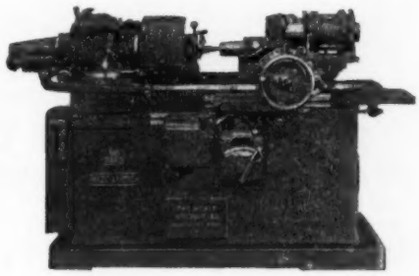
IMMEDIATE DELIVERY.. HIGH PRODUCTION ... LATE TYPES ..... COMPLETE *with electrical equipment*

GRINDERS



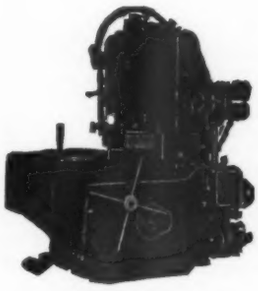
BRYANT — INTERNAL GRINDERS

No. 3—6" swing, 2" stroke.
No. 12-L—16" swing, 9" stroke.
No. 16-38—38" swing, 12½" stroke.
No. 24-L-36 Hydraulic, 36" swing, 27" stroke.
No. 24-36 Hydraulic, 36" swing, 19" stroke.
No. 24-B-36 Hydraulic, 36" swing, 19" stroke.
No. 16-AM-28 Hydraulic, 16" swing, 14" stroke.
No. 16-A-28 Hydraulic, 28" swing, 9" stroke.



HEALD — INTERNAL GRINDERS

No. 72A3—Sizematic
No. 72A5—swing 15½", stroke 20⅝".
No. 72A—swing 15½", stroke 14".
No. 70A.
No. 70—swing 15", stroke 11".
No. 73—10" hole dia., stroke 14".
No. 60—3" hole dia., stroke 16".



ROTARY SURFACE

No. 16 BLANCHARD, 26" magnetic chuck.
No. 16 BLANCHARD, 30" magnetic chuck.
No. 22 HEALD, 12" magnetic chuck.
No. 25A HEALD, 24 magnetic chuck.
No. 25 HEALD, 24" magnetic chuck.
No. 200 HEALD, 8½" magnetic chuck.

CYLINDRICAL GRINDERS

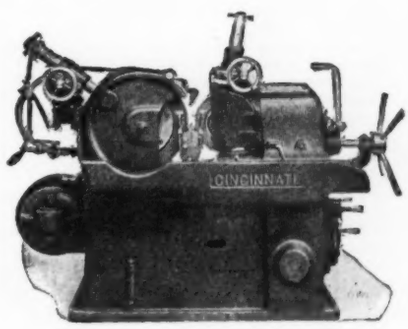
6" x 18" LANDIS Plain
6" x 32" NORTON Plain
10" x 24" NORTON Plain
10" x 24" LANDIS Plain
10" x 48" BROWN & SHARPE—No. 14—Plain.
14" x 48" NORTON Plain.
14" x 48" CINCINNATI Plain.
16" x 72" NORTON Plain.
12" x 60" BROWN & SHARPE No. 4 Universal.
16" x 32" LANDIS—Type AB—Hydraulic Crankpin.
21" x 48" LANDIS—Type D—Hydraulic Crankshaft.

SURFACE GRINDERS

6" x 24" THOMPSON, Hydraulic.
6" x 18" DOALL, Hydraulic.
4" x 8" BUILDERS.
OSTERHOLM, Horizontal, 25" x 45" table.

CENTERLESS GRINDERS

No. 2 CINCINNATI.



TOOL and CUTTER GRINDERS

No. 1 LE BLOND.
No. M-1 GRAND RAPIDS Tap.
No. 2 CINCINNATI.
No. 13 BROWN & SHARPE Universal.
15" GLEASON Spiral Cutter.
36" INGERSOLL Face Mill.
24" INGERSOLL Face Mill.
INGERSOLL Special Tool.

EMERMAN MACHINERY CORP.

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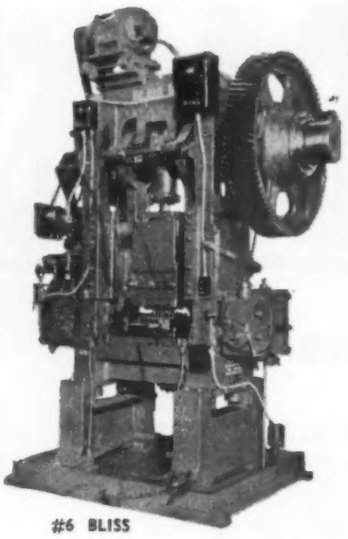


#6 BLISS

TREMENDOUS STOCK AT REDUCED PRICES

#87½, #88, #78½, #6 and many other Bliss Presses
Steam Hammers from 100 lbs. to 35,000 lbs. Erie, Chambersburg, Niles, etc.

LATHES

60" & 38" swing x 23' McCabe Double Spindle, M.D.
60"x32' Niles-Bement-Pond, G.H., Q.C., M.D.
50"x26' Johnson, G.H., M.D.
48"x24' Blocked to 80" Fifield, D.B.G.
37"x18' Bridgeford, G.H., Q.C., M.D.
36"x32' Lodge & Shipley Q.C., G.H., M.D.
36"x14' Niles, Q.C., G.H., M.D.
16"x 6' Monarch, M.D., Late type
Many others from 7" to 98" swing. Niles, Lodge & Shipley, American, Monarch, Hendey, Leblond, South Bend, Logan, etc.

TURRET LATHES

#5 Midland, M.D.
#4 Gishold, M.D.
#2, #3, #4, #5, #1A, #2A, #3A, Warner & Swasey
#1, #2 Foster
Many others from ⅝" to 6" capacity.

PLANERS

60"x60"x12' Pond, 4 heads, M.D.
48"x48"x10' Cincinnati, 4 heads, M.D.
36"x36"x12' Niles-Bement-Pond, 2 heads, M.D.
42"x42"x12' Pond, 4 heads, M.D.
36"x36"x8' Powell, 2 heads, M.D.
120"x25' and 36"x18' Dietrich & Harvey. Open side, M.D.

BORING MILLS

3½", 4", 5", 6" Horiz. Universal, Sellers, Ohio, Lucas, Niles, Defiance.
24" to 10' Vertical Bullard, Niles, Cincinnati, Betts, Colburn, etc.

MISCELLANEOUS

Gear Cutters
Bliss, Rafter, Ryerson, Hilels & Jones Rolls
#40 Waterbury-Farrell Thread Rollers
Saws
Many other special machines

SHAPERS

7" to 32" Rhodes, Smith & Mills, Gould & Eberhardt, Stockbridge, Walcott, etc.

MILLERS

#2, #3, #4, #5, Plain and Universal, M.D., Cincinnati, Brown & Sharpe, Milwaukee, Hendey, Van Norman.
#2, #3, #4, #5, Vertical, M.D., Brown & Sharpe, Cincinnati, Bridgeport, Baker.
#06, Cincinnati, Vertical, M.D.
Brown & Sharpe, Cincinnati and Briggs Production, M.D.

AUTOMATICS

#00, #2 Brown & Sharpe
2", 2½", 2¾" Cleveland, M.D.
Gridleys, Acmes, New Britains—latest models.

PUNCH & SHEARS

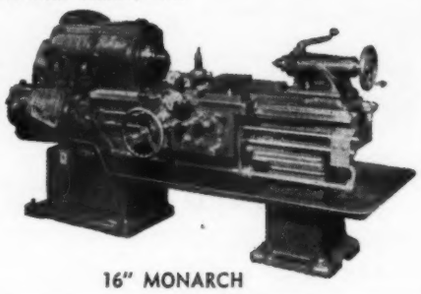
Cincinnati, Adlerhurst, Press Rite, Pels, Quickwerth, etc.

GRINDERS

Cylindrical, Plain and Universal, Landis, Norton, Brown & Sharpe, Cincinnati.
22"x72" Lempco Crankshaft. Late type.
Blanchard, Brown & Sharpe, Reid, Covel, Thompson, Sanford, Pratt & Whitney—Surface, #2, and #3 Cincinnati Centerless.
Brown & Sharpe, Gallmeyer & Livingston, Cincinnati—Universal Tool & Cutter
#70 Heald Internal, M.D.

HAMMERS, PRESSES AND OTHER FORGING EQUIPMENT

¼" to 8" Upsetters. Ajax Waterbury.
Hydraulic Presses, 60 to 3000 tons. Watson-Stillman, HPM, Farnham, Oil Gear Co. etc.
Mechanical Power Presses, up to 2000 tons. Ferracute, Toledo, Bliss, Waterbury, Z & H, V & O, Stiles & Parker Toggle Press about 350 ton 72" x 60" bed, 24-34" stroke.
#60¼ Toledo Power Press, 1200 ton
#57 Toledo Press, 100 ton, 75 ton Clearing



16" MONARCH

Complete plants for sale, such as toolroom, stamping, screw machines, etc.

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207 CENTRE STREET NEW YORK 13, N. Y.
MONA MEMBER

OTT MACHINERY SPECIALS

AUTOMATICS, Acme 9/16" & 1" Mod. C 5 spdle.
GREENLEE 2" 6 Spdl. M.D.
AUTOMATICS, Gridley, 9/16" x ⅞" Model G
AUTOMATICS, Cone, 1¼", 1½", & 2⅝" 4 spdle.
AUTOMATICS, Gridley, 1¼, 1⅝, 2¼", & 2⅝ Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" M.D.
AUTOMATICS, Cleveland 1¼, 1½, 2, 2½, 3½ & 4¾" Model A, M. D.
AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
CLEVELAND 3½" Model K-4 M.D.
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
CONOMATICS, 1⅜"—8 spindle, M.D.
DRILLS, High Speed B. B. 1 to 6 spindles
GEAR HOBBERS, #3 Barber-Colman, M.D.
GEAR SHAPERS, #6 Fellows, M.D.
GENERATOR, Gleason Spiral Bevel Gear 10"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72A Hydraulic, 2 M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18", M.D.
GRINDERS, Pratt & Whitney 12" Vert. Surface
LATHES, Hendey, E.B.M. type, 14"x7' & 8' M.D.
LATHES, Hendey, 16"x6' & 8' M.D.
LATHES, Reed-Prentice, 24"x12' G. H. M. D.
LATHES, Rockford, 16"x8' Geared Head, M.D.
LATHES, Turret Warner & Swasey #4 G.H.M.D.
LATHES, Morey #3 G.H. Turret, M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
MILLING MACHINES #2B Milw. & Vert. Hd.
MILLING MACHINES, Reed-Prentice #2V Vert.
MILLING MACHINES, Milwaukee #1B Universal #2, 2B & 3B Plain, M.D.
PLANER, Gray 30"x30"x8' two rail Hds.
PLANER, Ohio 42"x42"x10' One Head, M.D.
TAPPERS, Garvin 2X, M.D.
Thread Roller, Watson-Flagg. Late type—3/16" to 2½" cap.

OTT MACHINERY SALES, INC.
542 Second Avenue
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MONA MEMBER

AUTOMATICS

#2 Pratt & Whitney Jig Borer
Baker double end multiple spindle horizontal drill press
Single spindle Baker drill press
#2 Cincinnati cutter grinder
#3 Bryant Chucking machine
2B Davis Thompson Duplex 4 spindle continuous milling machine
Gisholt "Simplimatic" Timken bearing—M.D.
Avey Drill Press

GRINDERS

1—10"x36" Norton Plain, M.D.
1—16"x72" Norton Surface, M.D.
#2 Monarch Surface Grinder
#10 Blanchard Grinder

LATHES & TURRET LATHES

1—1B Foster Turret
1—3A Warner & Swasey
1—1A Warner & Swasey
2—#6 Warner & Swasey P.R.T.

DRILLS

4—6 Spindle Allen 8" High Speed #2 Morse Taper
1—3 Spindle Allen 8" High Speed #2 Morse Taper
3' Morris Radial Drill
4' Dresses Radial Drill
4' Fosdick Radial Drill

MILLS

#3B Kearney & Trecker P.R.T.
#2 Kearney & Trecker Timken Bearing Dial Feed
#3 Cincinnati Plain, S.P.D.

PRODUCTION LATHES

2—1x18" Pratt & Whitney Automatic
1—3" Sundstrand Stub Lathe, M.D.

PROFILES

1—30" Pratt & Whitney Profiler. Single spindle. M.D., Late type.
8x8 Atkins Hack Saw
2B Edlund Drill press

MILLS MACHINERY COMPANY
3126 Grand River, Detroit, Mich.

McDONALD
USED MACHINERY

G & E 16" & 24" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Barnes geared Camelback Drill Press, 4 sp.
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 16"x6' Lathes
American 24'x12' grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" Vert. Boring Mill
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Cincinnati 48" Auto Pl. Prod. Miller, S.P.D.
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No 2F Fastermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way., St. Louis 6, Mo.

LATE TYPE MACHINERY

RIGIDTURNER 8 SPINDLE CLEVELAND MODEL 8618
NEW BRITAIN GRIDLEY NO. 412 ROTATNG 4 SP. CHUCKERS, (5)
DENVER-ACME 6.2 TURRET LATHES (12)
LO-SWING AUTOMATIC 14"x32" and 5"x22"
MOREY TURRET LATHE #3 UNIVERSAL
LEES BRADNER THREAD MILLERS. No. 40 (3)
COULTER TYPE H, HOB THREAD MILLERS (5)
36"x14' INGERSOLL SLAB MILLER, 2 SIDE HEADS
KINGSBURY 8 STATION AUT. INDEXING DRILLING AND TAPPING MACHINE
CRONITE ROTO HYD. CUT OFF MACHINE

CONTINENTAL SALVAGE & MACHINERY CORP.
1836 Euclid Ave. Cleveland 15, O.

POWER PRESSES

No. 96A Toledo Double Crank Bed 44x48"
250 TONS

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

LIQUIDATION

OF

MACHINE SHOP EQUIPMENT

BARGAINS BARGAINS

BORING MILLS—Vertical

COLBURN 2 swivel heads, AC, MD
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 72", 2 swivel heads, DC, M.D.

DRILLS—Radial

MORRIS 3½'9" AC, MD
WESTERN 3' SPD
AMERICAN 4' 11" triple purpose AC, M.D.
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DRESES 4' 13" AC, M.D.
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MUELLER 4½' 9" AC, M.D.
MUELLER 4' 11" AC, M.D.
REED PRENTICE 4' AC, M.D.
RYERSON 4' 11" AC, M.D.
AMERICAN 5' 11" triple geared AC, M.D.
AMERICAN 5' 13" triple purpose AC, M.D.
AMERICAN 5' 13" triple geared AC, M.D.
AMERICAN 5' 13" Universal triple geared AC, M.D.
BICKFORD 5' 11" AC, M.D.
BICKFORD 5' 13" AC, M.D.
CARLTON 5' 15" AC, M.D.
CINCINNATI BICKFORD 5' 13" AC, M.D.
DRESES 5' 15" AC, M.D.
FOSDICK 5' 14" AC, M.D.
NILES BEMENT POND 6' 15" Universal AC, M.D.
REED PRENTICE 6' AC, M.D.
COLBURN #14, 2 spindle heavy duty

GRINDERS

BRIDGEPORT 18 x 110" face and knife
BROWN — SHARPE #13 Universal, M.D.
BRYANT #6 Internal, M.D.
DIAMOND 84" face and knife, M.D.
NORTON 10" x 18" plain cyl., M.D.
SELLERS #1 Tool Grinder
SELLERS #2 Universal Tool Grinder

LATHES—Engine & Turret

BARDON & OLIVER #7 Universal, arranged for bar work, latest type
HENDEY 20 x 8' bed tool room
WARNER & SWASEY #1A Universal, arranged for bar work, Timken bearing

MILLING MACHINES

CINCINNATI #5 Plain, high power, M.D.
CINCINNATI 48" duplex automatic SPD
KENT OWENS #1 hand

GEAR EQUIPMENT

GLEASON #40 spiral
BEVEL gear planer
GLEASON #12 Grinder

PLANERS

BELMAR 36 x 36 x 10' 2 heads, AC, M.D.
BICKETT 36 x 36 x 12' 3 heads, AC, M.D.
CINCINNATI 36 x 36 x 8' 2 heads box table, AC, M.D.
CINCINNATI 36 x 36 x 10' 2 heads, AC, M.D.
CHANDLER 36 x 36 x 20' 4 heads, AC, M.D.
GRAY 36 x 36 x 10' 2 heads, AC, M.D.
GRAY 36 x 36 x 8' Box table, 2 heads, AC, M.D.
LIBERTY 36 x 36 x 8' 3 heads AC, M.D.
NILES BEMENT POND 36 x 36 x 10', 3 heads, box table, DC, M.D.
OHIO 36 x 36 x 10' 2 heads, AC, M.D.
WOODWARD & POWELL 36 x 36 x 12' 3 heads, DC, M.D.
WOODWARD & POWELL 36 x 36 x 12' 4 heads, AC, M.D.
WOODWARD & POWELL 36 x 36 x 13' 4 heads, AC, M.D.
CINCINNATI 38x38x10' 2 heads, AC, M.D.
CINCINNATI 42 x 36 x 12' 2 heads, AC, M.D.
NILES BEMENT POND 42 x 42 x 12' 2 heads, AC, M.D.
OHIO 42 x 42 x 20' 2 heads, AC, M.D.
POND 42 x 42 x 12' 2 heads, AC, M.D.
WOODWARD & POWELL 42 x 42 x 10' 3 heads, AC, M.D.
WOODWARD & POWELL 42 x 42 x 10' 4 heads, AC, M.D.
GRAY 44 x 36 x 12' 4 heads, AC, M.D.
BELMAR 48 x 48 x 12' 3 heads, AC, M.D.
DETRICK & HARVEY 48 x 48 x 10' open side, box table, 3 heads, AC, M.D.
DETRICK & HARVEY 48 x 48 x 12' open side, 3 heads, D.C. M.D.
GRAY 48 x 48 x 14' 4 heads AC, M.D.
HAMILTON 48 x 48 x 16' 4 heads, DC, M.D.
NILES BEMENT POND 48 x 48 x 16' 4 heads AC, M.D.
NILES BEMENT POND 48 x 48 x 16' 2 heads, AC, M.D.
NILES BEMENT POND 48 x 48 x 14' 3 heads, AC, M.D.
PATCH 48 x 48 x 14' 4 heads, DC, M.D.
POND 48 x 48 x 16' 2 heads, AC, M.D.
PUTNAM 48 x 48 x 18' 4 heads, AC, M.D.
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CINCINNATI 60 x 48 x 14' 4 heads, AC, M.D.
GRAY 60 x 48 x 16' 3 heads, AC, M.D.
WOODWARD & POWELL 84 x 48 x 18" 2 heads, AC, M.D.

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CLEVELAND 50" x 10" 8 rolls
HILLIS & JONES #2 50" x 10" 6 rolls
NILES BEMENT POND #6 7' x 14" 6 rolls

MISCELLANEOUS

BAUSCH radial tapper
BETTS 18" Slotter
CINCINNATI 28" Shaper, 2 heads
NEWTON 15" Slotter, DC, M.D.
NILES 18" slotter, DC, M.D.
PEERLESS 4½ x 4½ hack saw, M.D.
ROCKFORD 16" shaper

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GRINDERS

6x18" Type C LANDIS HYDRAULIC CYLINDRICAL New 1941, 2⅜"x18" Grinding wheel, M.D.
No. 5 BRYANT INTERNAL, New 1937, Oil Pump, M.D., with motor and control (2)
NO. 39 EXCELLO INTERNAL THREAD GRINDERS, New in 1942.
NO. 2B BROWN & SHARPE SURFACE, 6x18" table, B & S Mag. chuck, motor in base.
NO. 2C REID SURFACE, 18x6¼" table, M.D. Parker Motorized Spindle.
NO. 3B THOMPSON SURFACE, 12x36" table, Motorized Spindle, A.C. M.D.
PRATT & WHITNEY DRILL & CUTTER, New in 1941
NO. 2 NORTON UNIV. TOOL & CUTTER
MODEL 10-W HAMMOND DOUBLE END TOOL & CUTTER, 11x19" tables, coolant pump, M.D.

LATHES

24"x10 FT. SPRINGFIELD FLOOR LATHE, Grd. Hd. M.D.
20"x32" LODGE & SHIPLEY FLOOR LATHE, Grd. Hd. Q.C.G., Motor in base (2)
16"x8 FT. HENDEY FLOOR LATHE, Grd. Hd., Q.C.G., Motor in base, Taper attachment
16"x8 FT. LEHMANN HYDRATROL, Grd. Hd., Q.C.G., Motor in base.
14"x32" LODGE & SHIPLEY, Grd. Hd., Q.C.G., Motor in base (2)
14"x54" REED PRENTICE MODEL B TOOL ROOM, Taper attachment, chuck, M.D. (2)
20"x25" FAY AUTOMATIC LATHES, M.D., Air chuck (4)
6" MODEL C SUNDSTRAND AUTO. PRODUCTION, New 1939, Air chuck, 11" swing, 43" length of bed, Coolant pump, M.D. (2)
NO. 4-A WARNER & SWASEY UNIVERSAL TURRET LATHE, Grd. Hd., 8¼" hole, M.D. 24" chuck
NO. 3-L GISHOLT TURRET LATHE, Timken Bearing Spindle, 6" hole, 26½" swing, A.C. motor in base, All grd. head, Power feed, Rapid traverse.

MILLING MACHINES

NO. 2-MH CINCINNATI PLAIN MILL, Grd. Hd., Timken bearings, Rapid traverse, 10½x52½" table; Motor in base. Dial feed.
NO. 2 VAN NORMAN PLAIN MILL, Grd. Head, Timken Bearing spindle, Rapid traverse, Motor in base; 12x50" table; Coolant pump.
No. 9-J GORTON VERTICAL MILLS, 10½x35" table, M.D. (2)
NO. 2 CINCINNATI, VERTICAL MILL, Adj. head, A.C. motor in base, 12x52" table, Dial type
NO. 2-K KEARNEY & TRECKER VERTICAL, Motor in base, Adj. Grd. Head, Dial Type.
18" CINCINNATI PLAIN MFG. TYPE MILL, New 1941, Grd. Head, 7⅜"x 26½" table; Coolant pump, M.D.
NO. 36 DEVLIEG ELECTRIC TOOL PRODUCTION MILL, B. G., 15x66" table; A.C. motor in base; Coolant pump.
4"x9" HANSON WHITNEY THREAD MILLS (3), New 1941, 33" bed, 9" bet. centers, Air chuck, Coolant pump, A.C. M.D.
NO. 9-U-3 NATCO 3-WAY HYDRAULIC DRILLING & BORING MACHINE, New 1942, 1¾" hole; each head individually driven.
FOX HORIZONTAL HYDRAULIC BORING & DRILLING MACHINES. New 1941.
FOX VERTICAL HYDRAULIC BORING & DRILLING MACHINES, New 1940.

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KANE AND ROACH ANGLE ROLL, M.D. with 7½ HP Motor, 2x2x¼"

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⅞" 4-SPINDLE NEW BRITAIN, Threading Spindle, Late Type, with chip conveyor & reel, new 1938.
⅜" CITY ENG. (CECO) SWISS TYPE AUTOMATIC SCREW MACHINE, New 1942 (2)
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6' American, Radial.

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16" x 30" Monarch with Keller Attachment.
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TURRET

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30"x14' AMERICAN 12-speed Lathe.
#3 NILES-BEMENT-POND, axle lathe, M.D.
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48" x 70' N.B.P. Engine Lathe

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48" x 48" x 15' NILES-BEMENT-POND four heads, 230 volt, D.C. reversing type planer motor and control.
60"x60"x20' NILES-BEMENT-POND, 2-Rail Heads, 2-Side Heads, 230 volt, D.C. reversing motor and control.
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60" CINCINNATI Spur Gear Cutter
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Manning, Maxwell, & Moore 47'4" Span

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American 47'4" Span
6-TON P & H 77' Span
American 77' Span
7½-TON—Shepard 36' Span
10-TON—Shaw 68' Span
Shaw 73' Span
P & H 30' Span
P & H 87' 6" Span
P & H 80' Span
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Morgan 60' Span
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42" Bullard New Era Vertical Turret
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36" x 36" x 8' Woodward & Powell
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#3 W & S. Univ. Bar Feed (1943)
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#4—W & S 1½" Screw Machine
#6—W & S 2" Screw Machine
6.2" Denver Chucking
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3', 9" Col. Cinc. Bick. Super Service
3' Western, Timken Bearing
3' Carlton sensitive
4' Hammond sensitive
4', 13" col. Carlton

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Nos. 10 & 18 Blanchard surface
8" x 24", No. 78 Wil. & Morgan surf.
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6"x18", No. 10 B. & S. elec. hydraulic
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12" x 24" ctrs. Sebastian grd. hd.
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14" x 6' & 16" x 6' American grd. hd.
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14" x 6' Mulliner
16" x 8' Springfield grd. hd.
30" x 60" ctrs. Lehmann Hydratrol
36" x 16' Bridgeford geared head

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No. 3S Cincinnati plain
No. 3B Brown & Sharpe plain
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30"x48" Newton Rotary
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Ingersoll planer type, various sizes
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13" Cincinnati plain Mfg.
No. 32 Kempsmith Mfg.
4" Rice Barton double spline
Pratt & Whitney double spline
No. 1 Davis & Thompson drum duplex
Ingersoll drum type duplex

PLANERS

33"x33"x8' Cincinnati, 3 heads
30"x30"x12' Cleveland openside, 2 heads

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16" Gould & Eberhardt (old style)
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MISCELLANEOUS

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Acme 3¼" M.D.
No. 1L Gisholt Univ. M.D.

Hilles & Jones Straightening Rolls 6' wide by ½" cap. plate, M.D. with controls, practically new.

GRINDERS

P. & W. 14", 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless, M.D.
B. & S. No. 1, 3 Universal
#25, #35, G. & L. M.D.

LATHES

McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey Grd. Hd.
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22" Putnam, S.C.G., D.C. M.D.
32"x86' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, Hand Screw
B. & S. No. 0
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New In Stock

5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws

RADIALS

4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4' 5' Western, S.P.D.
4' American Hole Wizard

MILLING MACHINES

Cincinnati, #2 Univ.
No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 18, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
K. & T., B. & S., No 2, 3 like new
B. & S. No. 2, 3, Vert.
Kempsmith No. 1 Univ.
No. 8½D Gorton Vertical, M.D.

MISCELLANEOUS

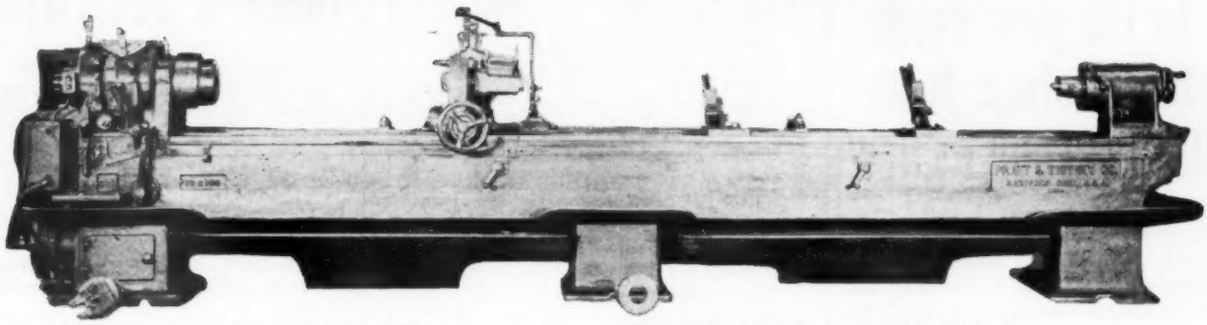
Gorton No. 1S, 3U Engraving Machine
6 spindle Avey Drill, 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
No. 8 Marvel Band Saw, M.D.

AARON MACHINERY CO.

45 Crosby St.
New York 12, N. Y.

10" x 168" Pratt & Whitney THREAD MILL

IMMEDIATE DELIVERY — EXCELLENT CONDITION



Length that can be cut between centers 168"
Dia. external thread that can be milled 10"
Lead that can be cut with regular gears: minimum, threads per inch 12; maximum, lead 48"
Depth that can be cut 1-9/16"
Collet capacity 3½"
Follow rest capacity 3½"
Index ring, regular, number of notches 12
Lead screw, threads per inch 2
Speeds: work spindle speed changes (by slip gears) 17; spindle speed, min. r.p.m. 0.08; spindle speed, max. r.p.m. 1.27; cutter spindle speeds (5) 44 to 144 r.p.m. with miscellaneous collets and equipment. Arr. for motor drive with 3 H.P. A.C. motor

Wire — Write — Phone

EMERMAN MACHINERY CORP.

875 W. 120th STREET **CHICAGO 43, ILLINOIS**

NEW

24" Cincinnati Shapers, M.D.
Abrasive No. 1½ Surface Grinders, M.D.
Racine 6x6" Hacksaws, M.D.
Famco No. 6-C Arbor Presses
Pexto No. 280 Circular Shears

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

SIP SWISS JIG BORER

TYPE MP #5B

An extremely accurate machine having a range of 22 x 34 x 26½" motor driven with 5 HP motor, 220 volt 3 phase, 60 cycle. Equipped with 24" rotary table, five boring heads, two indicators, four indicator extensions, three Jacobs chucks, three centers, much equipment. This machine is in excellent condition, and has its original accuracy.

J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN. Tel. 9-3393

No. 42 Ohio Universal Mill
14"x6' Hendey Lathe
Gridley Model H 4-spindle Chucking Machines.

MONA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

Boring Mills, 36"-42"-52"-72"-96".
Belt Cutters, 1"-1¼"-2"-2½"- Acme-Landis
Lathe, Turret 3-A W. & S. S.P.D.
Press, Forging 1000 Ton United St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Planer, O. S. 60"x60"x14' D. & H., M.D.
Profiler, #13 P. & W., B.D.
Shapers, 10"-20"-24"-36".
Shaper, 36" Morton Draw Cut

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

POWER PRESSES

Immediate Delivery — *Like New*

MODEL	TONS	STROKE	BED AREA	SHUT	DESCRIPTION
(4) Bliss #4½	75	1½-4½	21 x 26	18	Dble action, geared, roller feed & cut-off
(2) Bliss #5½	115	4½	33 x 42	20	Single action, dble crank, geared, air clutch
(3) Bliss #6	125	2-5½	24 x 31	14	Dble action, geared, roller feed & cut-off
(3) Bliss #7	180	1½-4½	28 x 36	15	Dble action, geared, roller feed & cut off, air clutch

KINGS COUNTY MACHINERY EXCHANGE

394 ATLANTIC AVENUE **BROOKLYN 2, N. Y.**

Phones: Triangle 5-5212, 5-5213, 5-5237

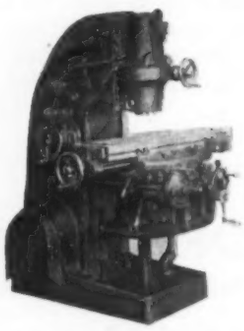
WIRE **PHONE** **WRITE**

MONA MEMBER

Place Complete Reliance on Botwinik to Fill your needs for Machine Tools

USED • REBUILT • NEW

Botwinik Brothers of Mass., Inc., a leader among the nation's machine tool rebuilders, carries every type of used and rebuilt machine tool in regular stock. To solve your machine problems quickly, with machines like these, wire or phone.



1—Milwaukee Mod. 2K Vert. Miller, M.D., Ser. No. over 31/3610, very latest type, tbl. wkg. surf. 56"x12", range: long. 28", cross 12", vert. 14", vert. move. of hed., 8", throat dep. 14".

• • • •

1—Putnam 84"x84"x40' Dbl. Hous. Planer, Revers., M.D. and controls, 2 heds. on cross rail, 2 side heds., can be inspected in operation.

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D., AC elect. equip., power rap. trav. to carr., compound rest, 2 steady rests, sw. over bed 36", sw. over carr. 28", dist. betw. cens. 48'.

1—Cin. No. 3 Vert. HI Power Miller, M.D., tbl. wkg. surf. 55¾"x13½", range: long. 34", cross 13", vert. 14", end spin. to tbl. top 22".

1—NEW Monarch 22"x22" Mod. M, 16 speed Helical Grd. Eng. Lathe, M.D., sw. over bed 30½", dist. betw. cens. 168", AC elect. equip., 11-500 RPM, power rap. trav. to carr., sw. over compound 21", 16 spin. speeds, coolant pump and piping. NEW in original crate. Never used. Built June, 1946.

Botwinik Brothers of Mass. Inc.

3 SHERMAN ST., WORCESTER 1, MASS.

TURRET LATHES — CHUCKERS

8—Denver 6" hole in spindle (1944) with air chuck equipment; geared head, motor in base 10 HP 3/60/550. No cross slides. Saddle Turrets only. Bargain price for the lot.

KINGS COUNTY MACHINERY EXCHANGE
394 Atlantic Ave., Brooklyn 2, N. Y.
Phone: TRiangle 5-5212-3
WIRE—PHONE—WRITE

HYDRAULIC FORGING PRESS

Specifications

Maker—Birdsboro
Rated Capacity—1200 Tons
Working pressure of oil, approx.—2000# p.s.i.
Diameter of main ram—39"
Stroke of main ram—18"
Number of pull-backs—2
Stroke of pull-backs—22"
Number of columns—4
Diameter of columns—14½"
Daylight (ram up)—36"
Distance bet. columns—R to L—90"
Distance bet. columns—F to B—28"
Pressing speed (max.)—13" per min.
Pump—Vickers
Motor—75 HP, 220/60/3

This press is also equipped with one spring suspended ball transfer table and one pair of approach tables.

IMMEDIATE DELIVERY
INSPECT IT NOW

J. LEE HACKETT CO.
1961 E. MILWAUKEE
DETROIT 11, MICHIGAN
TRINITY 2-6442-3-4

Automatics, 1⅝"x7", New Britain, MD. (2)
Boring Mills, Vert., 24 & 36" Bullard New Era, MD.
Boring Mills, Vert., 60" & 72", Motor Drive.
Drill, #25 Foote-Burt, 36"x3" cap. MD.
Forging & Riveting Machs., Ajax ⅞" cap. SPD.
Gear Hobber, 18" G. & E., Model NH., HD.
Grinder, Surface, #2 Reid, Mag. Chk., Gen., MD.
Grinder, Flexible Shaft, 2 HP 3/60/220, Port.
Lathes, Production, Duomatic 3-A. L. & S. MD.
Magnaflux, Model KQ-1, Motor 3/60/440 V.
Miller, Hand #1 Bristol with Motor 3/60
Millers, Univ., #2-SU. Van Norman, MD. 3/60 (2)
Miller, Thread, #4 Lees-Bradner, SPD.
Milling Machs., Plain, #1 & 2 Kempsmith, Motor 3/60.
Millers, Vert. #3 & 4 Cincinnati, Motor Drive.
Miller, Production, National Transit, MD.
Monorail Crane, 2-Ton American, 230 V. DC.
Planer, 10' x 8' x 24' Betts, 4-hds., DC., MD.
Planer, 5'x5'x18' N-B-P, 4-hds., DC. MD. A-1.
Presses, Tablet, Stokes Model T. Belted.
Oil Purifier, DeLaval, Unimatic, Motor 3/25/220.
Scale, Springless, Fairbanks-Morse, cap. 400#.
Turret Lathes, W. & S. #1, 4 & 6, Motor Drive.
Turret Lathe, 26"x7½" Libby-Int., chuck 8. MD.
Welders, 300, 400 & 600 Amp., MD.

GALBREATH MACHINERY CO.
Empire Building Pittsburgh 22, Pa.

PRODUCTION LATHE

#12 Gisholt Automatic. Code #17934 Swing over bed 16¾", over front carriage 12". New in 1939. Equipped with 12" air chuck, front carriage fadeaway, air operated tailstock, motor driven with AC motor.

J. L. LUCAS & SON, INC.
BRIDGEPORT 5, CONN. Tel. 9-3393

FOR SALE

LARGE QUANTITY OF TOOLS & EQUIPMENT

NEW HIGH SPEED DRILLS, in original packing, from ½" to 2-11/16", High Speed Taper Shank and Straight Shank.

BAND FILES, Doall precision, assorted sizes.

REAMERS, taper shank, spiral flute, assorted sizes.

BAND SAW BLADES, metal cutting, 12, 14, and 18 teeth per inch, assorted sizes.

FOR DETAILS AND INSPECTION—
WRITE—WIRE—PHONE

P. F. LOWINGER & CO.
90 WEST BROADWAY, N. Y. 7
REctor 2-3990

FOR SALE
10' Niles Vertical Boring Mill

80" dia. Table—Vee Drive
CANAL MACHINERY CO.
176 Lafayette St., New York, N. Y.

NEW—USED MACHINERY and EQUIPMENT
LARGE STOCK ON HAND
Hisco MACHINERY COMPANY
641-671 FRELINGHUYSEN AVE.
NEWARK 5, N. J. BIGELOW 3-3484-85

FOR SALE
PANTOGRAPH

GORTON 3-U PANTOGRAPH complete with tool grinder and many accessories. Like new, used very little.
344 N. CHURCH ST., KALAMAZOO, MICH.
CRESCENT ENGRAVING COMPANY

FOR SALE

4—36" New Era Type Bullard Vertical Turret Lathes. 2—4 jaw chuck table. 2—with cutting lubricant, motors 3 phase, 60 cycle, 220 volt, serials 11000-12000.

PRICE—$2,350.00 EACH

FS-739, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Buying
Good Used Equipment
is frequently the difference between having needed equipment or doing without it.

Finishing MACHINES

Undoubtedly one of the major opportunities of today, lies in the many thousand fine tools of modern production now idle. Here at your finger tips is a choice of the world's best machine tools—the tools that won the battle of production. Now they can be purchased, at prices far below original cost. Simply tell your nearest War Assets Administration Regional Office the kind and type of machine you need, or check and mail the coupon at right. (You'll find a portion of the available equipment listed on this and the following three pages.) Remember that whenever you purchase surplus property you are not only creating new opportunities for your own business, but also helping to stabilize U. S. Post War Economy.

MAIL TODAY*

To War Assets Administration:

Please send me information on the types of Finishing **Tools** checked below:

Name.....Tel. No.....

Firm.....

Address.....

City.....State.....

*For War Assets Administration address, see 4th page of this advertisement.

CHECK LIST

(These key numbers correspond to the machines listed as Special Buys! Simply check those in which you are interested.)

1..... 3.....

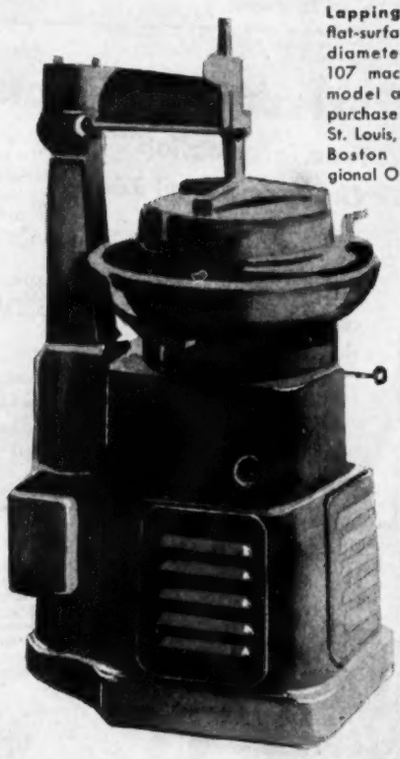
2..... 4.....

5.....

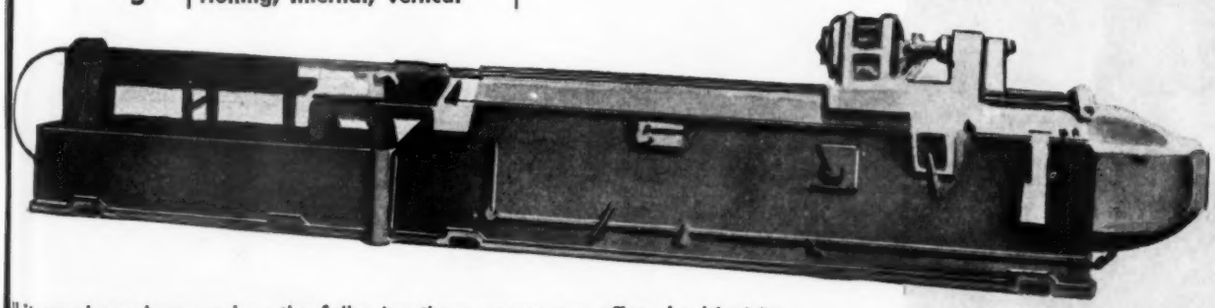
277-6

SPECIAL BUYS IN FINISHING TOOLS

KEY	MACHINE & TYPE	SIZE OR CAPACITY
1	Honing, internal, horizontal type	Under 6" Bore
2	Lapping, flat surface	24" diam. lap plate
3	Lapping, gear tooth, external	
4	Lapping, gear tooth, external and internal	
5	Honing, internal, vertical	



Lapping Machines, flat-surface type 24" diameter lap plate. 107 machines, of this model are awaiting purchase at the Detroit, St. Louis, Chicago and Boston W.A.A. Regional Offices.



Honing Machine, internal type, horizontal design. Size of bore, under 6". 175 machines similar to this one are located at warehouses in Detroit, Cleveland, Chicago and Philadelphia. Many other types also in stock are in other W.A.A. Offices.

ll items shown here and on the following three pages are offered subject to rior sale. This surplus property has previously been advertised and offered to rior claimants including Veterans of World War II.

MODERN TOOLS

Speed Production

AVAILABLE *Now* FROM GOVERNMENT-OWNED SURPLU

American Industry is faced by its greatest production problem—that of supplying many millions of people all over the world with all the long-awaited items of comfortable peacetime living. In its prompt solution lies an important profit opportunity for individual industries.

War Assets Administration is helping to meet this problem. We are making available to industry and business billions of dollars worth of government-owned war surpluses.

By means of this 4-page advertisement, War Assets Administration is telling as large a portion of indus as possible, what kinds and quantities of mach tools are available. If you are interested, other b ing information will be made available quickly. L over the listing at right carefully. Decide which these basic tools will help *you* solve immediate p duction problems. Then clip and mail the coupon the nearest W.A.A. office listed at the bottom of next page. Or if you prefer—phone your Regio Office today, and arrange a visit to inspect equipment you want to buy.

EXPEDITING COUPON

Free Information
Check and Mail Today!

To War Assets Administration*:

Please send me specifications, prices and other information on the items listed at right!

(To save writing simply use the key numbers shown in the left hand column of the list on opposite page.)

.....

.....

.....

Name.....

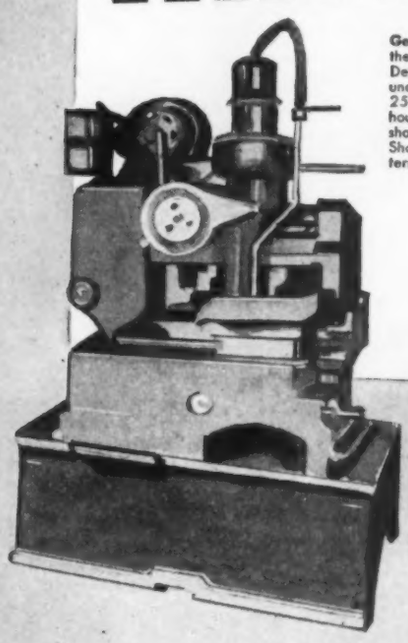
Firm.....Tel. No.....

Address.....

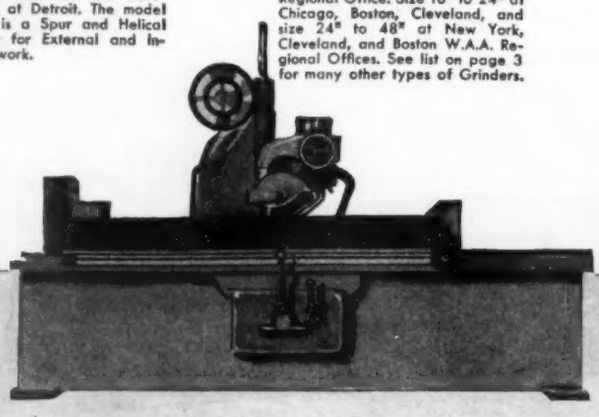
City.....State.....

*For WAA addresses see 4th page of this advertisement.

277-6

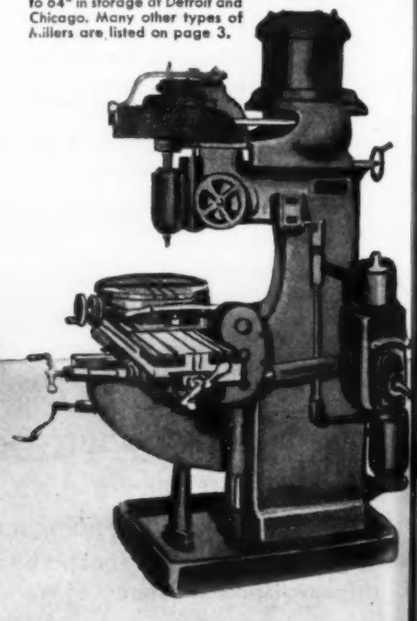


Gear Shapers are available in the W.A.A. Regional Offices at Detroit and New York in sizes under 12". Sizes from 12" to 25" in diameter are warehoused at Detroit. The model shown is a Spur and Helical Shaper for External and Internal work.



Surface Grinders. This is a reciprocating type, horizontal, split-power feed grinder. Large quantities of many sizes are available at Detroit Regional Office. Size 18" to 24" at Chicago, Boston, Cleveland, and size 24" to 48" at New York, Cleveland, and Boston W.A.A. Regional Offices. See list on page 3 for many other types of Grinders.

Standard Miller, typical of a large number of vertica spindle types. You'll find 281 with table travel under 12 at Cleveland and Detroit offices, and 147 of size 60 to 64" in storage at Detroit and Chicago. Many other types of Millers are listed on page 3.



CHECK LIST OF SPECIAL MACHINE TOOL BUYS!

Here are a few of the many hundreds of machine tools available to you through War Assets Administration:

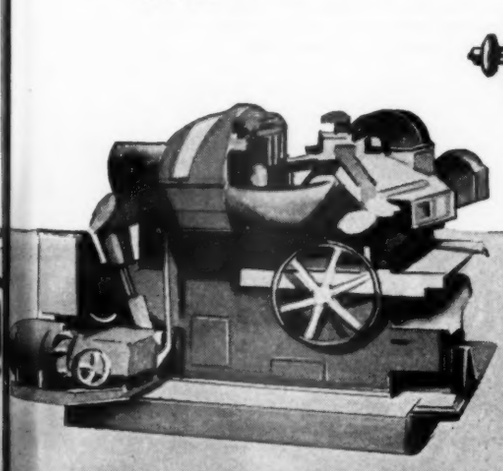
KEY	MACHINE	TYPE	SIZE OR CAPACITY
1	Boring, Drilling & Milling	Horizontal	Up to 6"
2	Boring & Turning Mills	Vertical	24" to 120" Swing
3	Boring & Turning Fixed Rail Mills	Vertical	
4	Precision Boring Machine	Horiz. bridge—single end	Under 8" to 14"
5		Horiz. bridge—double end	Under 8" to 14"
6	Drills	Sensitive Bench	
		Box Column single spindle	Under ½" Cap. Up to 22" Swing
7			½" to 1" Cap. 16" to 24" Swing
8		Sensitive Bench Round Column—Single spindle	Under ½" Cap. Up to 22" Swing
9			½" to 1" Cap. 16" to 24" Swing
10		Sensitive Floor Box Column—1 to 6 spindle	Under ½" Cap. 12" to 22" Swing
11			½" to 1" Cap. 16" to Over 24" Swing
12			1" Cap. and over 24" Swing & over
13		Sensitive Floor Round Column 1 to 6 spindle	Under ½" Cap. 12" to 22" Swing
14			½" to 1" Cap. Under 16" to 42" Swing
15		Sensitive Floor Upright Type—Box Col. 1 to 6 spindle	Up to 28" Swing
16		Sensitive Floor Upright Type—Round Col. 1 to 6 spindle	Up to 28" Swing
17		Heavy Mfg. Type	Up to 32" Swing
18		Spec. Kingsbury Way Vertical	
19	Multi-Tool	Heavy Duty Mfg. & Production (Not automatic)	Up to 20" Swing
20	Lathe	Single Spindle—Horiz. Platen Type	
21		Single Spindle—Horiz. Turret Type	
22		Multi Spindle—Horiz. (4-5-6 & 8 spindle)	
23		Multi Spindle—Vertical (6 and 8 spindle)	
24		Auto. Between Centers Horiz. Single Spindle	All sizes
25	Screw Machine	Auto—Bar—Single Spindle	Up to 1½" Cap.
		Auto—Bar—5 Spindles	All sizes
26		Auto—Bar—8 Spindles	1½" and Over Cap.

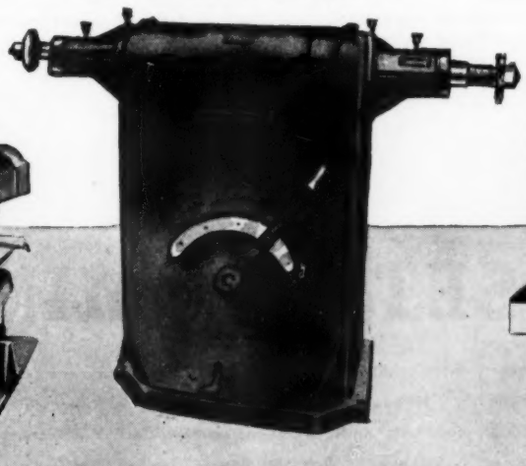
KEY	MACHINE	TYPE	SIZE OR CAPACITY
27	Miller	Horiz.—Plain—Hand Feed	10" and Over Table Travel
28		Horiz.—Plain—Knee Type	All sizes
29		Vertical—with Sliding Swivel Universal Heads	All sizes
30		Automatic	All sizes
31		Bed Type—Plain—Horiz. Spindle	All sizes
32		Vertical Spindle—Std.	All sizes
33		Vertical Fixed Bed Profiler (1 & 2 Spindle)	
34		Thread—Universal—Not Automatic	12" and over Work Diam.
35		Thread—Universal—Auto.	Up to 20" Cap.
36		Thread—Auto.—Chucking	
37		Planetary	6" to Over 10" Work Diam.
38		Spline	
39	Engravers	Pantagraph—2 Dimensions	
40	Polishers & Buffers	Floor Type	½ to 10 H.P.
41	Lathe	Speed Type	Up to 3 H.P.
42	Saws	Circular Cut-Off	
43	Lathes	Cut-Off	Under 1" Bore
44	Abrasive Machine	Belt Drum & Disc	
45	Abrasive Cut-Off		
46	Tapping	Vertical—1 & 2 Spindle	
47		Horizontal—1 Spindle	
48	Die Threading	Bolt Rotary—1 Spindle	
49	Centering	Double End—Horizontal	
50	Pointing, Chamfering & Burring		
51	Shaver	(Not Gear)	
52	Reamer	(Not Rifle)	
53	Drawing Machine		100,000# and over
54	Machinery & Equipment Allied to Primary Metal Forming Machine & Equipment	Pickling	All sizes
55	Gear Hobber	Horizontal	4" to 16" Cap.
56		Vertical—Universal	Under 16" Diam.
57	Flame Cutting Machine		
58	Hardness Tester	Brinell—Portable & Power	
59		Rockwell—Manual & Power	
60	Inspection Machine	Magnetic (Magnaflux)	
61	Balancing Machine	Static	
62		Dynamic	
63	Grinder	External Cylindrical—Plain	Up to 20" Swing

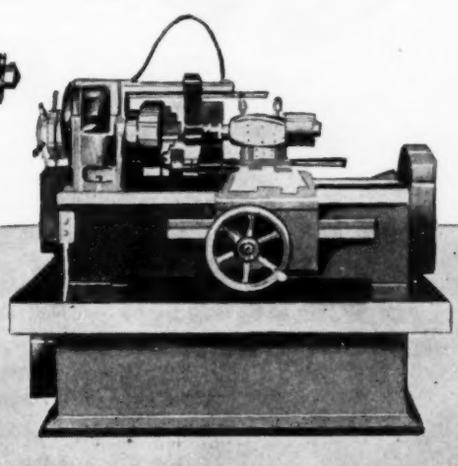
Gear Cutter Bevel. Straight tooth generators (12" shown) are now available at Detroit, New York and Philadelphia. Other sizes may be located at W.A.A. Regional Offices in Detroit, Chicago and New York.

Polishing and Buffing Machines. The heavy duty floor type shown is available in large quantities. There are 657 machines from ½ to 1 H.P. in Cleveland; 100 machines 1 to 3 H.P. in Cleveland and Detroit; 90 machines 3 to 5 H.P. in Detroit and Boston, and 633 machines, 5 to 10 H.P. or above in Detroit, Cleveland, Chicago and Boston.

Universal Thread Miller. This automatic thread miller is one of the many types and sizes now available for purchase at W.A.A. Regional Offices in Detroit, Boston, Chicago, Cleveland. Check list above for detailed information on other types of milling tools.







FREE INFORMATION

To War Assets Administration:

Without obligation please send me detailed information on the following machine tools:

.....

.....

(Write in any type of machine tool you need)

Name.....Tel. No.....

Firm.....

Address.....

City.....State.....

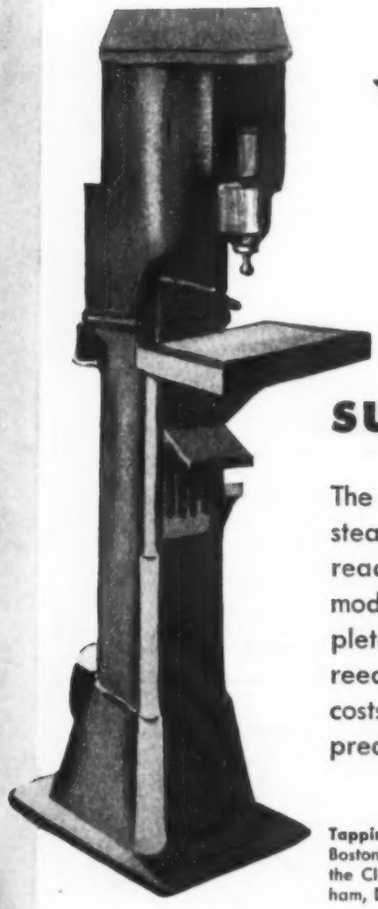
277-6

ABRASIVE CUT-OFFS

Abrasive Cut-off Machine. For this and all other machine tools shown in these four pages, simply contact your nearest W.A.A. Regional Office listed below. Each of these offices can give you information about present inventories of machine tools . . . or better yet mail the coupon at left. 112 abrasive cut-off machines are available now and more will be declared surplus.

VETERANS OF WORLD WAR II

—to help you in purchasing surplus property, Veterans' units have been established in each War Assets Administration Regional Office.



GOVERNMENT-OWNED SURPLUS PRODUCTION EQUIPMENT

The machine tools shown on this and the preceding three pages, produced a steady flow of equipment during the war. Now that their job is done they are ready for application to civilian production needs. Huge quantities of all models and types are available—so many that they simply couldn't be completely listed on these few pages. For you these machines spell opportunity to reequip your plant for postwar markets quickly and at low cost. Certainly it costs little to investigate. Simply circle the item or items listed on this and preceding pages—clip out the coupons and mail today.

TAPPING MACHINES

Tapping Machines. Over 400 of the one spindle, vertical type are waiting for purchase in Detroit, Chicago, Boston and Philadelphia warehouses. Two spindle models, (not shown) may be inspected at warehouses of either the Cleveland or Boston W.A.A. Regional Offices. 259 horizontal one spindle machines are being sold at Birmingham, Detroit, Cleveland, Chicago, and Philadelphia Regional Offices.

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SEARCHLIGHT SECTION

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(Continued from page 270)

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on preliminary negotiations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

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They have a sound record of successfully selling machine tools and other mechanical products requiring engineering in their application.

They have the necessary time available for the promotion of a new product or the continuous sales effort required by an established line.

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To sell improved fixture clamps direct to industrial plants. Should represent other lines used by tool makers and draftsmen. Knowledge of fixture designing and making, desirable. Protected territory—very attractive commission—high class product —backed by direct-by-mail and publication advertising. Write, giving lines now handled, territory covered, experience, personnel, etc. Address

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able to undertake
manufacture under License of

American Sheet Metal Working Machinery

with preference for Heavy Duty Power Guillotines.

Representative visiting U.S.A. October

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Great Bridge **Staffs, England**

Do you want to operate your own metal product manufacturing business? If so, here's your opportunity.

Owner of medium size forging and manufacturing plant located central U.S.A., employing approximately 70 men, desires to get away from production pressure and labor problems. Will consider selling at a reasonable price and on terms if necessary to one or more individuals.

Plant is now in production on an automotive accessory product with national distribution through hardware jobbers and auto parts houses. Indications point to an unlimited market for two or three years.

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FOR HIGHER PRODUCTION

King Industries tooling added to Gisholts, LoSwings, LeBlond, and similar Automatic Turret Lathes, 16-24" swing, taper and milling attachments on every machine.

Two to Four Weeks Delivery Including the Machine.

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WANTED
ROLL GRINDER

Used, traveling table type roll grinder to grind rolls 32"x168" complete with crowning attachment.

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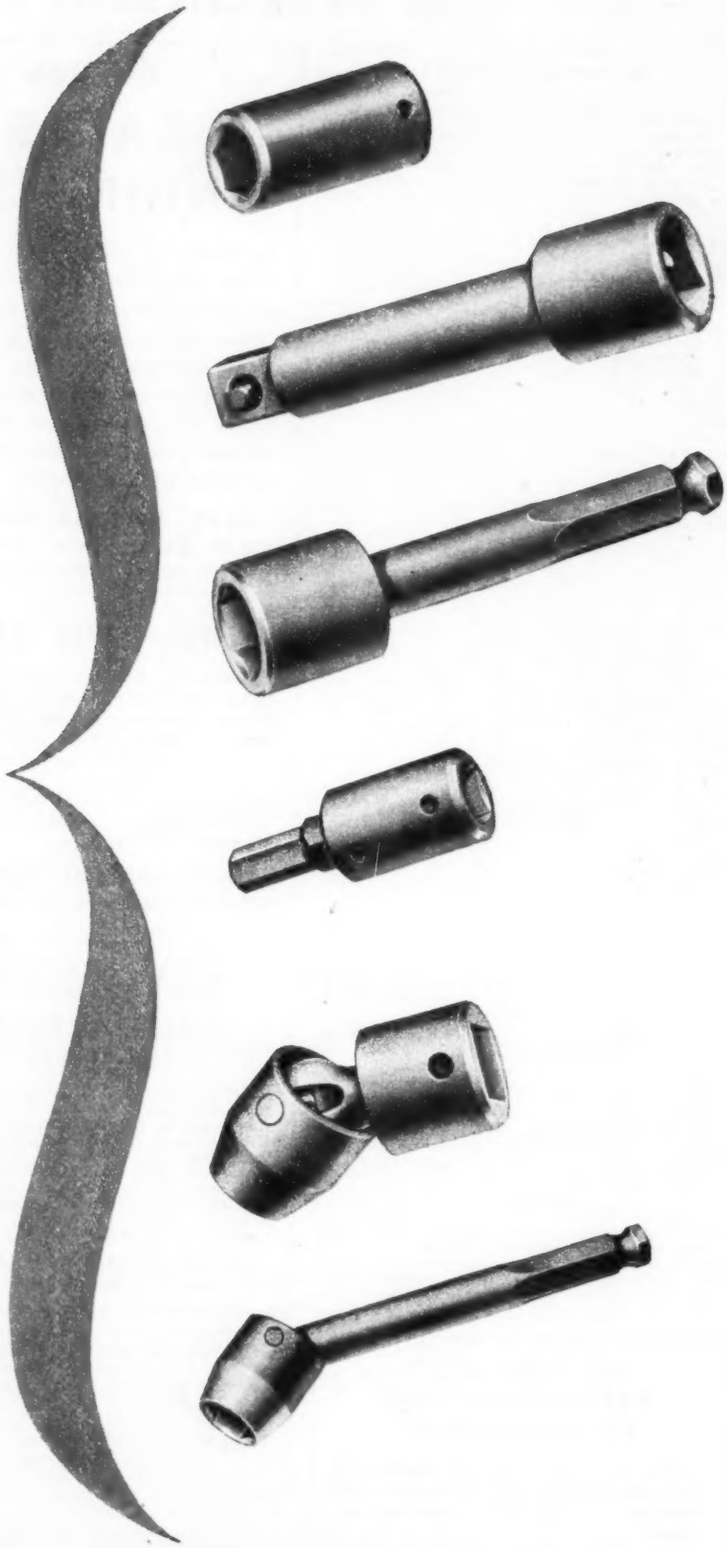

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Select from thousands of standard items—or if you need specials, send a sketch, print, or description, and we'll quote promptly. Write for Catalog 18.

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Safety Friction Tapping Chucks; Quick Change and Positive Drive Drill Chucks; Vertical Float Tapping Chucks; Parallel Floating Tool Holders; Power Bits for Phillips, Slotted Head and Clutch Head Screws; Hand Drivers for Phillips and Clutch Head Screws; Aircraft and Industrial Universal Joints; Sockets and Universal Joint Socket Wrenches.

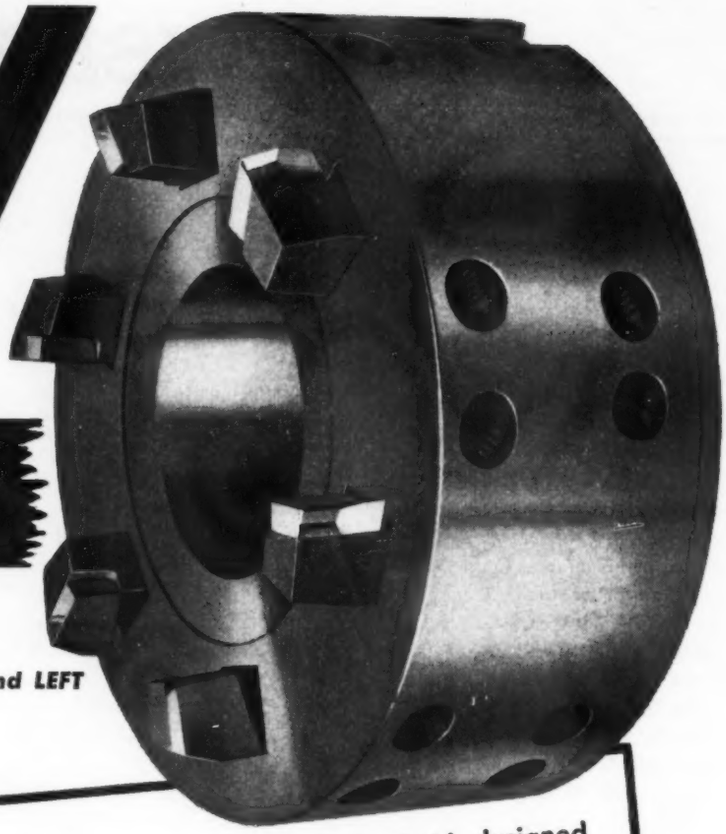
ADVERTISERS INDEX

	Page
Abbott Ball Co.	202
Abrasive Machine Tool Co.	250
Accurate Bushing Co.	240
Ace Drill Corp.	241
Acme Machine Tool Co.	80
Acromark Co.	246
Adams Company	56, 209
Allied Products Corp.	28
Allis-Chalmers Mfg. Co.	86
Almond Mfg. Co., T. R.	250
Aluminum Co. of America	83
American Broach & Machine Co.	82
American Magnesium Corp.	65
American Screw Co.	165, 198
American Tool Works Co.	20, 21
Ames Co., B. C.,	260
Anton Machine Works	240
Apex Machine & Tool Co.	288
Armstrong-Blum Mfg. Co.	90
Armstrong Brothers Tool Co.	40
Atlantic Gear Works	207
Atlantic Screw Works	198
Atlas Ball & Screw Co.	198
Automotive Gear Works, Inc.	204
Avey Drilling Machine Co.	234
Axelson Mfg. Co.	233
Bantam Bearings Div.	196
Barber-Colman Co.	69
Barrett Co., Leon J.	264
Baumbach Mfg. Co., E. A.	214
Baush Machine Tool Co.	225
Bell Engineering Co.	185
Bilgram Gear & Machine Wks.	209
Black & Decker Mfg. Co.	171
Blake Co., Edward	246
Blanchard Machine Co.	89
Blank & Buxton Machinery Co.	192
Bokum Tool Co.	248
Brewer Machine Co., Wm. F.	214
Brown & Sharpe Mfg. Co.	261
Bryant Chucking Grinder Co.	59
Bryant Machinery & Engr. Co.	229
Buhr Machine Tool Co.	238
Burke Machine Tool Co.	236
Butterfield Div. Union Twist Drill Co.	50
Cadillac Gage Co.	94
Carboloy Co., Inc.	179
Card Mfg. Co., S. W.	51
Carlton Machine Tool Co.	228
Carpenter Steel Co.	262
Central Screw Co.	198
Century Electric Co.	177
Chambersburg Engineering Co.	60
Chandler Products Corp.	198
Cimcool Div., Cincinnati Milling Machine Co.	17
Cincinnati Bickford Tool Co.	95
Cincinnati Electrical Tool Co.	264
Cincinnati Gear Co.	206
Cincinnati Grinders Incorporated	10, 11
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	26
Cincinnati Shaper Co.	100
Clark Controller Co.	183
Cleerman Machine Tool Co.	229
Clemson Brothers, Inc.	224
Cleveland Punch & Shear Wks. Co.	48
Cleveland Twist Drill Co.	245
Columbus Die Tool and Machine Co.	264
Cone Automatic Machine Co.	27
Continental Screw Co.	198
Continental Tool Wks., Div. of Excello Corp.	36
Corbin Screw Div. Amer. Hdwe. Corp.	198
Coulder Machine Co., James	228
Crafts Co., Inc., Arthur A.	246
Criterion Machine Works	254
Cross Company	68
Cuno Engineering Corp.	29
Danly Machine Specialties, Inc.	214
Davis & Thompson Co.	226
Davis Keyseater Co.	228
Dayton Rogers Mfg. Co.	265
Dearborn Gage Co.	180
Dempster Brothers, Inc.	242, 243
Denison Engineering Co.	212
Desmond-Stephan Mfg. Co.	244
Detroit Bevel Gear Co.	209
Detroit Reamer & Tool Co.	248
Detroit Tap & Tool Co.	163
DeVlieg Machine Co.	64
Do All Co.	215
East Shore Machine Products Co.	263
Ericsson Screw Machine Products, Inc.	261
Errington Mechanical Laboratory	258
Etna Machine Co.	213
Excello Corp.	36
Fairfield Mfg. Co.	208
Federal Machine & Welder Co.	256, 257
Fellows Gear Shaper Co.	8, 9
Fiske Bros. Refining Co.	202
Fitchburg Grinding Mach. Corp.	44
Foote Bros. Gear & Mach. Corp.	205
Fosdick Machine Tool Co.	42
Freedom-Valvoline Oil Co.	200
Gallmeyer & Livingston Co.	224
Ganschow Gear Co.	207
Gardner Machine Co.	45
General Die & Stamping Co.	258
General Electric Co., Apparatus Dept.	67, 93
Geometric Tool Co.	88B
Geroter May Corp.	191
Giddings & Lewis Machine Tool Co.	72, 73
Gisholt Machine Co.	63
Gleason Works	3
Goss & deLeeuw Machine Co.	222
Grant Gear Works	206
Grant Mfg. & Machine Co.	214
Gray Co., G. A.	38
Greenfield Tap & Die Corp.	88A
Gulf Oil Corp.	61
Hamilton Tool Co.	224, 236
Hardinge Brothers, Inc.	43
Harper Co., H. M.	198
Hartford Special Machinery Co.	206, 258
Heald Machine Co.	2nd Cover
Hill Acme Co.	66
Holliday & Co., W. J.	211
Holman Reamer Co.	238
Hones, Inc., Charles A.	265
Hydraulic Press Mfg. Co.	75
Hydropress, Inc.	92
Independent Pneumatic Tool Co.	76
Ingersoll Milling Machine Co.	37
International Screw Co.	198
J & S Tool Co.	254
Johnson Machine Co., Carlyle	223
Jones & Lamson Machine Co.	6, 7
Kearney & Trecker Corp.	47
Kelley Gear & Tool Co.	209
Kempsmith Machine Co.	81
Kent-Owens Machine Co.	230
Kester Solder Co.	244
Kex National Service	186
King Machine Tool Co.	54
Kingsbury Machine Tool Co.	227
Knight Machinery Co., W. B.	220
Lake Erie Engineering Corp.	210
Lamson & Sessions Co.	198
Landis Machine Co.	14, 15
Landis Tool Co.	18, 19
Leland-Gifford Co.	218
Lempco Products, Inc.	55
Lincoln Electric Co.	34, 35
Linley Brothers Co.	226
Littell Machine Co., F. J.	254
Lodge & Shipley Machine Tool Co.	155
Lovejoy Tool Co., Inc.,	290

NEW

LOVEJOY "CUTSALL"

CARBOLOY TIPPED CEMENTED CARBIDE TOOL-BIT-TYPE FACE MILL

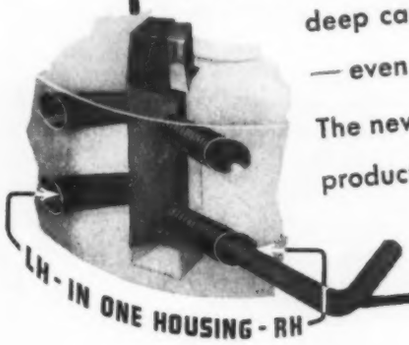


- ***POSITIVE and NEGATIVE RAKE, RIGHT and LEFT HAND in ONE HOUSING***
- ***FINE BLADE ADJUSTMENT***
- ***EXTRA LARGE CARBOLOY TIPS***

Lovejoy proudly presents another new face milling cutter that is designed especially for the most modern milling practices. The tool-bit-type blades can be supplied for right- or left-hand cutting, with the same housing. The extra large Carboloy tips mean extra long wear — the face of the blades is back of center so that positive or negative rake is easily obtained from the same blades. The rear on the blade is tapered so that fine adjustment may be made with rear set screw—front set screw securely locks blade in the housing. Blades are sharpened on an off-hand, adjustable table grinder exactly the same as regular lathe tools.

This new Carboloy tipped "Cutsall" cutter is available in 6", 8", 10" and 12" diameter sizes. All sizes use the same blades for convenience and economy. Note the husky, balanced construction—it is your guarantee that facing cuts up to ¾" deep can be taken on tough stock even when spindle speeds are high — even when cuts are intermittent.

The new Lovejoy "Cutsall" has the goods to deliver the goods. Write for production information, prices and delivery — all three will please you.



LOVEJOY
TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

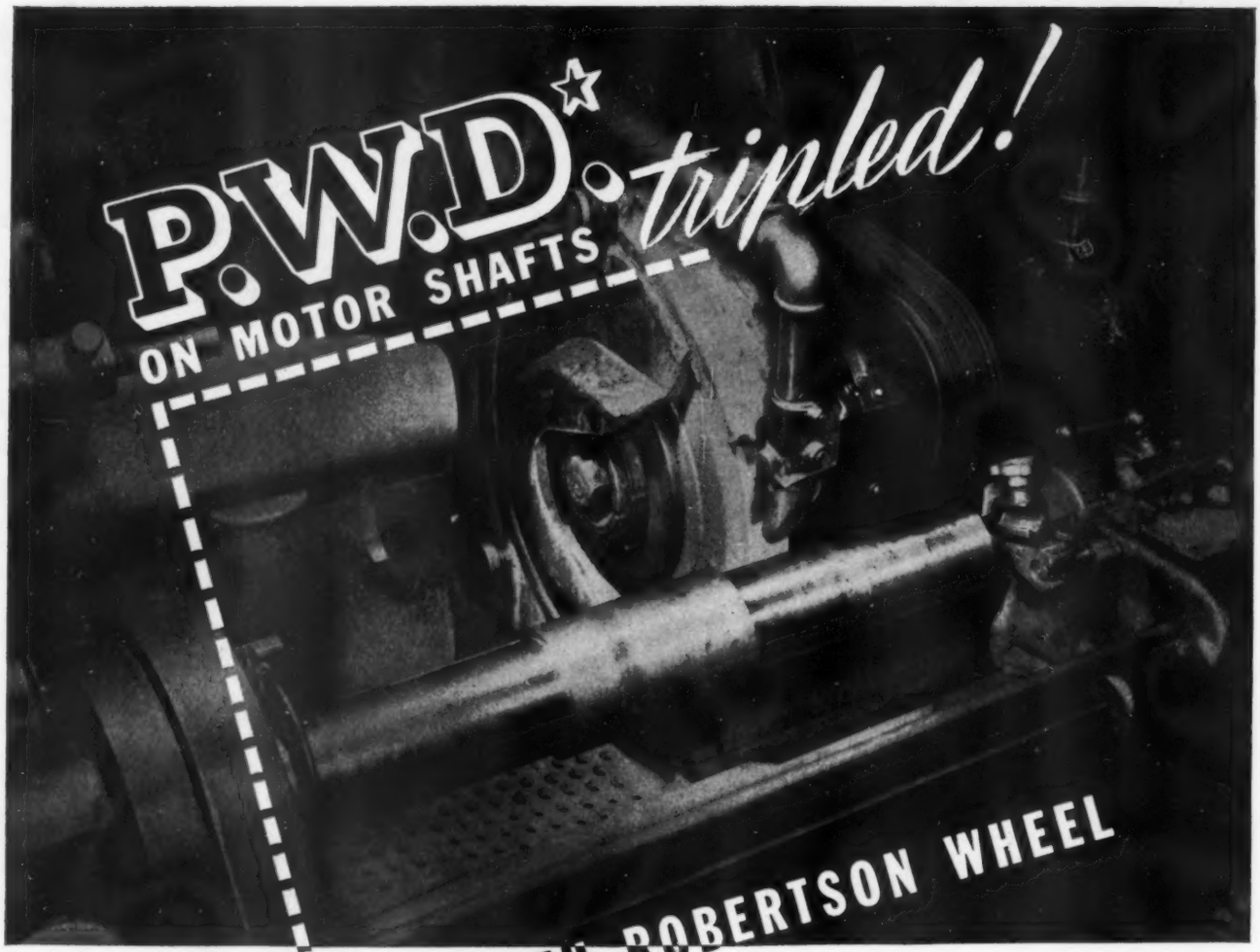
ADVERTISERS INDEX

	Page
Luers, J. Milton	266
Lufkin Rule Co.	188
Manufacturers Screw Products	198
Master Electric Co.	197
Mattison Machine Works	216
McCaskey Register Co.	181
McCrosky Tool Corp.	161
McGraw-Hill Book Co., Inc.	194, 263, 268
McKiernan-Terry Corp.	250
Meehanite Research Institute	199
Meisel Press Mfg. Co.	206
Mid-West Abrasive Co.	70
Milford Rivet & Machine Co.	198
Miller-Knuth Mfg. Co.	250
Mitts & Merrill	238
Modern Tool Works	221
Monarch Machine Tool Co.	159
Morey Machinery Co., Inc.	222
Morris Machine Tool Co.	98
Morse Twist Drill & Mach. Co.	24, 25
Murray Mfg. Co., D. J.	266
National Acme Co.	52, 53
National Lock Washer Co.	193, 198
National Machine Tool Co.	238
National Screw & Mfg. Co.	198
Newark Gear Cutting Mach. Co.	206
New Britain-Gridley Mach. Div. New Britain Mach. Co.	3rd Cover
New England Screw Co.	198
New-Field Machined Parts Co.	182
Nicholson & Co., W. H.	240
Noble & Westbrook Mfg. Co.	261
Norgren Co., C. A.	178
Norma-Hoffman Bearings Corp.	189
North Brothers Mfg. Co.	192
Norton Company	22, 23
Oakite Products Inc.	262
Oakland Engineering Co.	200
Oilgear Co.	249
Oliver Instrument Co.	228
Parker-Kalon Corp.	198
Pawtucket Mfg. Co.	202
Pawtucket Screw Co.	198
Pheoll Mfg. Co.	198
Phillips Screw Manufacturers Brush Div.	198
Pittsburgh Plate Glass Co.	88
Portage Machine Co.	232
Potter & Johnston Machine Co.	39
Pratt & Whitney Div., Niles-Bement-Pond Co.	57
Production Machine Co.	232
Producto Machine Co.	246
Quaker City Gear Works, Inc.	207
Randall Co., Frank E.	238
Rapids Standard Co. Inc.	265
Reading Screw Co.	198
Reed-Prentice Corp.	228
Reeves Brothers Inc.	259
Refiners Lubricating Co.	170
Revere Copper & Brass, Inc.	169
Rivetf Lathe & Grinder Inc.	62
Roberts Rubber Co., Weldon	253
Robertson Mfg. Co.	292
Rolled Thread Die Co.	232
Russell Burdsall & Ward Bolt & Nut Co.	198
Rustless Iron & Steel Div. American Rolling Mill Co.	173
Ruthman Machinery Co.	200
Ryerson & Sons, Inc., Joseph T.	174
Safety & Maintenance Co.	170
Scovill Mfg. Co.	198
Sellers & Co., Wm.	235
Seneca Falls Machine Co.	219
Shakeproof, Inc.	198
Shell Oil Co. Inc.	96
Shore Instrument & Mfg. Co., Inc.	268
Sier-Bath Gear Co. Inc.	208
Simonds Abrasive Co.	144
Snyder Tool & Engineering Co.	74
Socony-Vacuum Oil Co., Inc.	239
Sommer & Adams Co.	217
South Bend Lathe Works	58
Southington Hardware Mfg. Co.	198
Square D Co.	195
Standard Conveyor Co.	176
Standard Oil Co. (Indiana)	56A, 56B
Standard Tool Co.	251, 252
Staples Tool Co.	85
Stark Tool Co.	266
Steel Co. of Canada, Ltd.	198
Sterling Bolt Co.	198
Strand Mfg. Co.	214
Stuart Oil Co., Ltd., D. A.	260
Sundstrand Machine Tool Co.	32, 33
Sun Oil Co.	187
Super Tool Co.	46
Tannewitz Works	226
Threadwell Tap & Die Co.	237
Tidewater Associated Oil Co.	247
Timken Roller Bearing Co. (Steel & Tube Div.)	84, 4th Cover
Titeflex, Inc.	203
Torrington Co., Bantam Bearings Div.	196
Torrington Co.	167
Torrington Co.	214
Union Twist Drill Co.	49
U. S. Drill Head Co.	248
V & O Press Co.	214
Van Keuren Co.	87
Van Norman Co.	12, 13
Veeder-Root, Inc.	91
Veraloy Products Ltd.	262
Vickers Inc.	175
Victor Machinery Exchange Inc.	255
Vinco Corporation	77, 78, 79
Wade Tool Co.	41
Waldes Koh-I-Noor, Inc.	201
Walker Co., Inc., O. S.	240
Waltham Machine Works	236
Warner & Swasey Co.	30, 31
Warren City Mfg. Co.	16
Waverly Petroleum Products Co.	170
Webber Gage Co.	142
Weldon Tool Co.	172
Wendt-Sonis Co.	190
Westinghouse Electric Corp.	71
White & Bagley Co.	248
Wickes Brothers	231
Willson Products Inc.	184
Wilson Mechanical Instrument Co.	266
Wolverine Bolt Co.	198
Woodworth Co., N. A.	157
Wyzenbeek & Staff Inc.	260
Zeh & Hahnemann Co.	214

SEARCHLIGHT SECTION

Classified Advertising

Classification	Page
BUSINESS OPPORTUNITIES	287
CONTRACT WORK	269
Buxton Co., John L.	269
General Pattern Works	269
Greist Mfg. Co.	269
La Salle Engineering Co.	269
Morhardt & Co., Charles	269
M & N Machine Tool Works	269
Possy's Tool & Mfg. Co.	269
Smith Mfg. Co., J. & H.	269
EMPLOYMENT SERVICE	287
PATENT ATTORNEY	287
POSITIONS VACANT	270
POSITIONS WANTED	287
REBUILDING SERVICE	279, 280, 282, 287
Botwinik Bros. of Mass.	282
Hill-Clarke Machy. Co.	280
King Industries Co.	287
Simmons Machine Tool Corp.	279
SELLING OPPORTUNITIES	270, 287
WANTED TO PURCHASE	287
USED EQUIPMENT	271-287
Aaron Machinery Co.	276, 280, 281
American Car & Foundry Co., Inc.	277
Armstrong Cork Co.	287
Bliss Co., E. W.	278
Botwinik Bros. of Mass.	282
Brooks, B. D.	278
Brownell, Hazard	278
Burlake Mfg. Co.	287
Canal Mchy. Co.	282
Continental Salvage & Mchy. Corp.	276
Crescent Engraving Co.	282
Delta Equipment Co.	279
DeWitt Tool Co.	274
Dony Machinery Co., D. E.	281
Economy Co., Inc.	279
Emerman Machinery Co.	275, 281
Falk Machinery Co.	271
Galbreath Mchy. Co.	282
Hackett Co., J. Lee	282
Hasco Machinery Co.	282
Hill-Clarke Machinery Co.	280
Hyman & Son, Joseph	274
Indianapolis Machy. & Supply Co.	274
Interstate Machinery Co., Inc.	278
King Industries Co.	287
Kings County Machy. Exch.	279, 281, 282
Lowinger & Co., P. F.	282
Lucas & Son, Inc., J. L.	278, 281, 282
McDonald Machinery Co.	276
Miles Machinery Co.	280
Mills Machinery Co.	276
Morey Machinery Co., Inc.	272, 273
National Machy. Exchange	279
Osborne & Sexton Machinery Co.	274
Ott Machinery Sales, Inc.	276
Paul's Motor & Machy. Supply	274
Reynolds Machinery Co.	279
S. & S. Machinery Co.	276
Saloway, J.	277
Simmons Machine Tool Corp.	279
War Assets Administration	283, 284, 285, 286
West Penn Machinery Co.	281
Wigglesworth Machy. Co.	274
Zeeve & Co., Alex.	278



A MANUFACTURER of motor shafts removing .015″ to .020″ stock from S.A.E. 1040 steel ground to a tolerance of plus .001″, minus .000″, was able to finish only 10 pieces per wheel-dressing on his Plain Cylindrical Grinding Machine.

Production was being slowed by frequent work-stoppage for dressing the wheels which, naturally, were being worn out by too many dressings or truing operations.

After studying the problem, a Robertson engineer recommended an 18″ x 2″ x 5″ RA 46 MV Robertson Wheel. With no other change in grinding method, production was immediately increased from 10 to 30 shafts per wheel-dressing, resulting in longer wheel life, decreased production costs and savings on wheel costs, as well.

Even if you are *satisfied* with your present wheel-performance, it may surprise you to find how much more and better work you can get out of a Robertson Wheel. Send for Robertson booklet, or "blue-print" your grinding problem and let us recommend a wheel.

★ PRODUCTION PER WHEEL-DRESSING

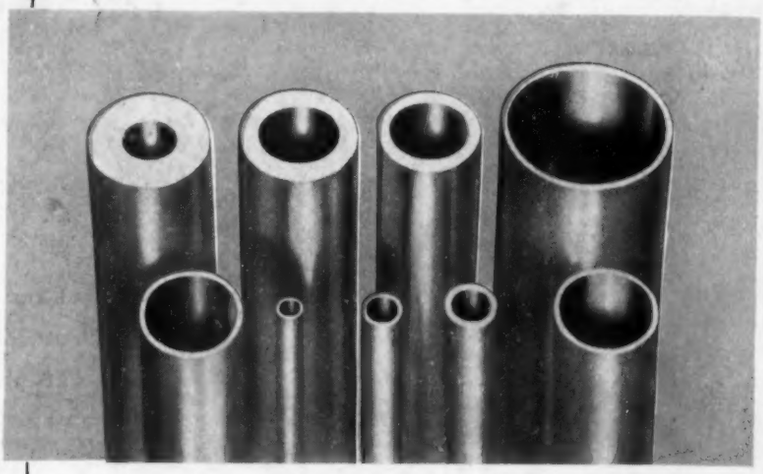
ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY
Manufacturers of Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

16 WAYS TO CUT COSTS

by machining parts from Timken Seamless Tubing

If you machine cylindrical or ring shaped parts out of bar stock, consider these 16 possible ways to save by using Timken Seamless Steel Tubing:

1. *Save* by eliminating heavy drills.
2. *Save* by reducing machine tool wear.
3. *Save* by faster machining.
4. *Save* by less evaporation of coolant due to better circulation.
5. *Save* by less tool wear due to lower temperature.
6. *Save* by quicker gaging of cooler surfaces.
7. *Save* by more accurate machining resulting from cooler operations.
8. *Save* by less grinding of smoother machined surfaces.
9. *Save* by combining more operations.
10. *Save* by releasing screw machine stations.
11. *Save* by cheaper handling of lighter stock.
12. *Save* on magazine recharging time due to lighter stock.
13. *Save* by reducing tool changes.
14. *Save* on tool grinding operations.
15. *Save* by use of longer stock in magazines.
16. *Save* by reducing crop-end losses.



★ When Timken Seamless Steel Tubing replaces bar stock in production of tubular parts, amount of the saving usually comes as a surprise to the user. And quite often, performance of the finished part is definitely improved because of the ability of Timken Metallurgists to tailor alloy steel tubing to exacting specifications.

The Timken Roller Bearing Company is the world's largest *producer*, and at the same time the world's largest *user* of alloy steel seamless tubes for mechanical applications. Its Technical Staff is recognized everywhere as the undisputed authority on production, selection and machining of alloy steel seamless tubes. For a Job Analysis of any part you make, write Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
Fine Alloy
STEEL AND SEAMLESS TUBES

★ YEARS AHEAD — THROUGH EXPERIENCE AND RESEARCH

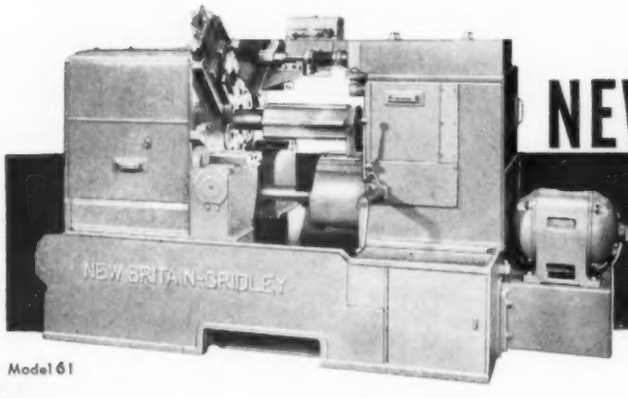
SPECIALISTS in hot rolled and cold finished Alloy Steel Bars for forging and machining applications, as well as a complete range of Stainless, Graphitic and Standard Tool Steel analyses. Also Alloy and Stainless Seamless Steel Tubing for mechanical and pressure tube applications.

LEADERSHIP BASED ON ACCOMPLISHED FACTS

This motor armature shaft, made by a well-known electric motor manufacturer, is 9-25/32" long, with a .686 diameter. When turned on a New Britain Model 61 Six Spindle Automatic Screw Machine using free cutting screw stock, the rate of production is two hundred and ten pieces per hour. Because the stock is supported by a rotating pick-off spindle, with a roller support close to the cutoff tool, the part is finished at both ends with no cutoff burr left. Nine operations are performed in seventeen seconds.

Whether your work calls for small pieces or large, complex or simple, you can find the most logical answer in New Britain Multiple Spindle Automatics *plus* the engineering know-how of our tool layout specialists. When the subject is high production and low cost per piece, it's time to talk with the New Britain representative in your locality.

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION



Model 61

NEW BRITAIN AUTOMATICS

M-0104